

5-146

0051704

Figure 5-34

plants by its dense matting and by producing chemicals that discourage other plants from taking root. Christmas berry (*Schinus terebinthifolius*) is an aggressive rapidly spreading tree whose dense canopy shades out understory plants and creates single species stands. This tree is most common in the mesic (moderately moist) forests and is not thought to be a threat to the wetter native communities.

South Range Acquisition Area

The SRAA is adjacent to Del Monte agricultural land and the Honouliuli Preserve, a 3,962-acre forest area managed by The Nature Conservancy since 1990. The preserve is habitat for over 70 rare species and contains five vegetation community types that are native to Hawai'i (HINHP 1994). The proposed acquisition land consists mainly of lowland dry shrubland and grassland and agricultural fields. The native natural communities and sensitive species are mostly restricted to the upper elevations of the Waianae Mountain range included in or adjacent to this proposed acquisition area.

A 0.3-acre dry cliff area is in the southwest portion of the SRAA, near the border of Honouliuli Preserve. The dominant vegetation in these communities is often 'ōhi'a (*Metrosideros polymorpha*) or lama, with understory shrubs like 'a'ali'i and 'akoko. Grasses can be native or introduced.

East Range

SBER is in central O'ahu, and shares boundaries with the town of Wahiawā to the northwest, Kamehameha Highway to the west, Kahana Valley to the east, KLOA to the north, the USFWS James Campbell National Wildlife Refuge and private agricultural and forestland to the south. SBER contains native moist and wet forest types toward the Ko'olau Summit. These communities change to predominantly nonnative vegetation in the lower elevations. SBER covers 5,145 acres.

Wheeler Army Airfield

WAAF, an airfield with runways and ancillary facilities, is between the Main Post and SBER. It is a developed area that contains mainly nonnative urban vegetation.

Vegetation

The following vegetation communities described below occur in multiple places of the SBMR, WAAF, and SRAA ROI, as shown in Figure 5-35.

The mixed fern/shrub community is a fairly restricted community in the topmost reaches of the Ko'olau Mountains, and rainfall generally exceeds 150 inches (381 centimeters) (USARHAW and 25th ID[L] 2001a). Common fern species in the area include *Sadleria* spp., *Cibotium* spp., pala'ā (*Odontosoria chinensis*), and *Diplazium* spp. Common shrub species include manono (*Hedyotis* spp.), 'ōhi'a, 'ōheloa (*Vaccinium* spp.), and pū'ahanui (*Broussaisia arguta*). The only rare plant listed within this community at SBMR is O'ahu violet (*Viola oahuensis*).

SRAA and may occur on the property (TNC 2000). Mostly nonnative and common birds such as the myna are expected to use the SRAA because of its highly disturbed nature and the agricultural habitat that it provides.

Nonnative bird species known to occur in SBMR include the red-billed leiothrix (*Leiothrix lutea*), white-rumped shama (*Copsychus malabaricus*), Japanese bush warbler (*Cettia diphone*), rock dove (*Columba livia*), spotted dove (*Streptopelia chinensis*), zebra dove (*Geopelia striata*), common myna (*Acerodotheres tristis*), red-vented bulbul (*Pycnonotus cafer*), and the Japanese white-eye (*Zosterops japonicus*). The nutmeg manakin (*Lonchura punctulata*), red-crested cardinal (*Paroaria coronata*), barn owl (*Tyto alba*), Erchel's francolin (*Francolinus erckelii*), ring-necked pheasant (*Phasianus colchicus*), house sparrow (*Passer domesticus*), chestnut manakin (*Lonchura malacca*), and northern cardinal (*Cardinalis cardinalis*) are also species that have been introduced by humans on O'ahu and are likely to occur on SBMR. Similar nonnative bird species are expected to occur in the SRAA.

Fish

The following endemic fish are known to inhabit the Waikele Stream, which runs through the Main Post: 'o'opu nākea (*Awaous guamensis*), 'o'opu naniha (*Stenogobius hawaiiensis*), 'o'opu hi'ukole, 'o'opu 'ōkuhe (*Eleotris sandvicensis*), āholehole (*Kuhlia sandvicensis*), and 'ama'ama (*Mugil cephalus*) (USARHAW and 25th ID[L] 2001a). Although these species have not been confirmed on the Main Post, they may occur within that portion of the waterway. No fish data are available specific to Kaukonahua South Fork Stream on SBER (USARHAW and 25th ID[L] 2001a), but information was gathered for Kaukonahua (Ki'ihi'i) Stream, which includes the Poamoho tributary on KTA and may represent some species at SBER. Native fish identified from the Kaukonahua Stream assessment include 'o'opu nākea, 'o'opu naniha, 'o'opu 'ōkuhe, and 'o'opu hi'ukole (USARHAW and 25th ID[L] 2001a). Nonnative species known to Waikele Stream on SBMR include the mangrove goby (*Mugilogobius canifrons*), liberty mollies (*Poecilia spehnops*), shortfin mollie (*P. mexicana*), bristle-nose (*Ancistrus* spp.), tilapias (*Tilapia melanotheron*, *Tilapia* spp.), Chinese catfish (*Clarias fuscus*), guppies (*Poecilia* spp., *P. reticulata*), loach (*Misgurnus anguillicaudatus*), mosquito fish (*Gambusia affinis*), *Thiaira tuberculata*, swordtail (*Xiphorus belleri*), *Lymnea reticulata*, and *Melanoides* spp. The following nonnative species may occur at SBER: swordtail, tilapia, snakehead (*Ophiocaracustristatus*), stickfish (*Xenetodon canis*), threadfin shad (*Dorosoma petenense*), midas cichlid (*Ampilophus citrinellum*/*Cichlasoma labiatum*), oscar, (*Astronotus ocellatus*), jewel cichlid (*Hemichromis elongatus*), bluegill (*Lepomis macrochirus*), *Carassius auratus*, *Ancistrus* spp., *Lophopodella carteri*, *Pterygoplichthys multiradiatus*, and bass (*Micropterus* spp.). The Wilson Lake overflow channel, which Helemano Trail would cross, is perennial but it is not known if fish inhabit this human-made stream. There is no documented aquatic species information available for the SRAA.

Sensitive Species

Sensitive species include special status, or regulated, species such as federal or state listed endangered, threatened, candidate species, or proposed species, Marine Mammal Protection Act (MMPA) species, federal and state species of special concern, and locally regulated species. Rare species that have had rapid population decline or whose habitat has markedly decreased in recent years are also considered sensitive species. Potential sensitive species at SBMR were identified by HDLNR (2002a), USARHAW biologists, and the HINHP (1994).

A current list of all sensitive plant and wildlife species and any critical habitat found in the SBMR ROI is provided in tables 5-23 and 5-24. The likelihood of a species occurring at SBMR is based on the habitat requirements and geographic distribution of the species, existing on-site habitat quality, and the results of biological surveys. Natural history descriptions of sensitive species with the potential to occur in the ROI, and specific locations if known, can be found in Appendix I-1 (Recovery Plans 1-1a; Plants I-1b; Wildlife 1-1c; Critical Habitat I-1d).

Sensitive Plant Species

The training areas that make up SBMR are home to 57 rare plant species. The USFWS has also designated critical habitat for areas within the SBMR ROI but there is no designated critical habitat on the Army installations. Documented occurrences of sensitive plant species in the ROI are shown in Figure 5-36 and Table 5-23. Two species within the ROI were not included in the Section 7 consultation. The Army will need to determine the status and location of *Nototrichium humile* and *Lobelia niihauensis* before Section 7 consultation begins again.

Sensitive Wildlife Species

The following discussion includes only those special status wildlife species that are considered likely to be found in the project area. Twenty-eight special status wildlife species are known to occur or have the potential to occur at SBMR or its vicinity (R. M. Towill Corp. 1997b). These include twenty-two rare invertebrates (twenty of which are endangered mollusks), one damselfly and one wasp species, as well as five rare birds and an endangered bat (USARHAW and 25th ID[L] 2001a). Documented occurrences of sensitive wildlife species in the ROI are shown in Figure 5-37. Table 5-24 lists sensitive terrestrial wildlife species and their likelihood of occurrence in the SBMR ROI. Sensitive species occurring within the ROI are most likely to occur in the higher elevations of the Wai'anae and Ko'olau Mountains and are unlikely to occur in the disturbed lowland areas, which make up a large portion of the ROI. There is one wildlife species with a recovery plan in the ROI (Appendix 1-1).

Sensitive Habitats

Critical Habitat

Army lands were excluded from the 2003 plant critical habitat designations for O'ahu based on the essential contribution that Army-led natural resource conservation actions play in the stabilization of threatened and endangered species. Small portions of critical habitat may occur within the ROI but outside of installation boundaries. The USFWS has designated critical habitat within the SBMR ROI: 180 acres for 12 plants and 4,620 acres for O'ahu 'elepaio. Plants with critical habitat within the ROI are listed in Appendix I-1d and are shown in Figure 5-34. Critical habitat for designated plants is shown in Figure 5-38 and critical habitat for O'ahu 'elepaio is shown in Figure 5-39.

Table 5-23
Sensitive Plant Species Occurring or Potentially Occurring in the SBMR/WAAF ROI

Scientific Name	Hawaiian Name/ Common Name	Federal Status	State ² /Global ³ Status	Habitat	Date Last Observed	Likelihood of Occurrence
<i>Abutilon sandwicense</i>	NCN	E, CH	-/G1	Dry to moist lowland forest	2003	C
<i>Alectyon macrococcus</i> var. <i>macrococcus</i>	'ala 'alahua, māhoe/-	E, CH	-/G2	Moist forest and gulch slopes in native dominated forest	2000	C
<i>Alsinidendron trinervis</i>	NCN	E, CH	-/G1	Wet forest slopes	2003	C
<i>Bobea sandwicensis</i>	'ahakea/-	<u>SOC</u>	-/G1	Moist to wet forests	2002	C
<i>Chamaesyce rockii</i>	'akoko, koko, kōkōmālei/-	E, CH	-/G1	Wet 'ōhi'a-uluhe forests on upper ridges	1993	C
<i>Cyanea acuminata</i>	Hāhā/-	E, CH	-/G1	Moist to wet forests	2001	C
<i>C. grimesiana</i> spp. <i>obatae</i>	Hāhā/-	E, CH	-/G2	Moist to wet forests	1992	C
<i>C. koolauensis</i>	Hāhā/-	E, CH	-/G1	Moist to wet forest	2000	C
<i>C. lanceolata</i> ssp. <i>calynia</i>	Hāhā/-	C	-/G1	Moist to wet forest	1999	C
<i>C. membranacea</i>	Hāhā/-	<u>SOC</u>	-/G2	Moist to wet forest	1992	C
<i>Cyrtandra subumbellata</i>	Ha'iwale/-	E, CH	-/-	Moist to wet forests	2000	C
<i>Dehisca subcordata</i>	NCN	E, CII	-/G1	Moist forest	2000	C
<i>Dielia fakata</i>	Palapalai lau li'i/-	E, CH	-/G1	Dry forests in deep shade or open understory	2000	C
<i>Dissocladus biflorus</i>	-/NCN	<u>SOC</u>	-/G2	Diverse moist forest slopes	1994	C
<i>Doodia novaei</i>	-/NCN	<u>SOC</u>	-/G1	Dark moist forests and near streambanks	1993	C
<i>Dubautia sherffiana</i>	Na'ena'e/-	<u>SOC</u>	-/G1	Dry coastal and wetter inland ridge tops	2000	C
<i>Exocarpos gaudichaudii</i>	Heau/whisk broom sandalwood	<u>SOC</u>	-/G1	Moist ridges and shrubland, often associated with 'ōhi'a	2000	C
<i>Flueggea neowawraea</i>	Mehamehame/-	E, CH	-/-	Moist forests and gulch slopes	2000	C
<i>Gardenia manningii</i>	Nānū, nā'ū/-	E, CH	-/G1	Moist to wet forests dominated by 'ōhi'a	1992	C
<i>Hesperomeles arborescens</i>	NCN	E, CH	-/-	Slopes and ridges in wet forest	2000	C
<i>Iosidendron longifolium</i>	aupaka/-	T, CH	-/-	Diverse moist forest on rocky slopes	2000	C
<i>Joinvillea ascendens</i> ssp. <i>ascendens</i>	Ohe/-	C	-/G5	Wet forests and along streams	1992	C
<i>Labordia cyrtandrae</i>	kāmakahala/-	E, CII	-/G1	Moist valleys and forests	2000	C
<i>L. kaniae</i>	kāmakahala/-	<u>SOC</u>	-/G1	On ridges in diverse moist forest	2001	C
<i>Lepidium arbuscula</i>	'ānaunau, naunau, kūnānā/-	E, CH	-/G1	Commonly found on exposed ridges and cliffs	2000	C
<i>L. tenuis</i>	nehe/-	<u>SOC</u>	-/G2	Found only in the central Wai'anae Mountains in diverse moist forest	2001	C
<i>Lobelia gaudichaudii</i> var. <i>koolauensis</i>	NCN	E	-/-	Wet cloud-swept slopes	2000	C
<i>L. mitchamii</i>	pānaunau/-	E, CH	-/G2	Wet windswept summits	2001	P
<i>L. hypoleuca</i>	pānaunau/-	<u>SOC</u>	-/G3	Dry ridges and canyons in diverse moist forest	2001	C
<i>L. yuccoides</i>	pānaunau/-	<u>SOC</u>	-/-	Dry ridges and canyons in diverse moist forest	1995	C

Table 5-23
Sensitive Plant Species Occurring or Potentially Occurring at SBMR/WAAF ROI (continued)

Scientific Name	Hawaiian Name / Common Name	Federal Status	State ² /Global ³ Status	Habitat	Date last Observed	Likelihood of Occurrence
<i>Melicope christophersonii</i>	'alani/-	C	-/-	Wet forest	1997	C
<i>M. cinera</i>	'alani/-	SOC	-/G1	Native dominated moist forests	2000	C
<i>M. sandwicensis</i>	'alani/-	SOC	-/-	Diverse moist forests	1993	C
<i>Neraudia melastomatifolia</i>	ma'aloa/-	SOC	-/ G2	Diverse moist forests	2000	C
<i>Nototrichium humile</i>	Kului / NCN	E, CH	-/G2	Remnant dry forest and cliff faces	To Be Determined	P
<i>Panicum beechyi</i>	NCN		-/G2	Mesic ridges and gulch bottoms	2002	C
<i>Phlegmariurus nutans</i> (<i>Scopodium nutans</i>)	wāwaciolc/-	E, CH	-/-	Wet forest	2000	C
<i>Phyllostegia hirsuta</i>	ulihī/-	E, CH	-/G1	Steep shaded slopes in wet to moist forests	2001	C
<i>P. kaalaensis</i>	ulihī/-	E, CH	-/G1	Steep shaded slopes in wet to moist forests	2001	C
<i>P. mollis</i>	ulihī/-	E, CH	-/G1	Steep shaded slopes in wet to moist forests	2000	C
<i>Plantago princeps</i> var. <i>princeps</i>	'ale, laukahi kuahiwī/-	E, CH	-/-	Moist cliffs and rainforests	2000	C
<i>Platycladus cornuta</i> var. <i>tornata</i>	pilo kea/-	C	-/G2	Moist forest	2000	C
<i>Platycladus cornuta</i> var. <i>decurvens</i>	pilo kea/-	C		Moist forest	1999	C
<i>Pleomele forbesii</i>	halapepe/-	C	-/G1	Dry and moist forests	2000	C
<i>Pteralyxia macrocarpa</i>	kaulu/-	C	-/G2	Valleys and slopes of diverse moist forest	2000	C
<i>Pteris ligulata</i>	waikamanui/-	E, CH	-/G1	Lowland wet forests	2000	C
<i>Sanicula purpurea</i>	NCN	E, CH	-/G1	Moist forests in deep soil	2001	C
<i>Schiedea hookeri</i>	mā'oli'oli/-	E, CH	-/G1	Diverse moist forest	2000	C
<i>S. longistriata</i>	mā'oli'oli/-	SOC	-/G2	Diverse moist forest	1992	C
<i>S. pentandra</i>	mā'oli'oli/-	SOC	-/G2	Diverse moist forest	1994	C
<i>Sicyos lanceoloides</i>	'anunu/-	SOC	-/G1	On ridges or spurs in moist forest	2000	C
<i>Strongylodon ruber</i>	NCN	SOC	-/G1	Mid-elevation wet forest	2001	C
<i>Tetraplasandra gymnocarpa</i>	'ōhe'ohe/-	E, CH	-/G1	Wet to moist summit forests	2000	C
<i>Viola chamaesauriana</i> spp. <i>chamaesauriana</i>	'olopū, Pānakani/-	E, CH	-/G3	Moist, somewhat exposed cliff habitat	2000	C
<i>V. oahuensis</i>	NCN	E, CH	-/-	Wet forests on cloud-swept summits	2001	C

Sources: USFWS 2002a; USARHAW and 25th ID[L] 2001a; PCSU 2001

Notes:

NCN = No common name

Status:

¹Federal:
E = Endangered
occurrences)

SOC = Species of concern

C = Candidate species for listing

CH = Critical habitat designated or proposed for designation

²State:
/- = No Status

³Heritage Global Rank:

G1 = Species critically imperiled globally (typically 1-5 current

G2 = Species imperiled globally (typically 6-10 current occurrences)

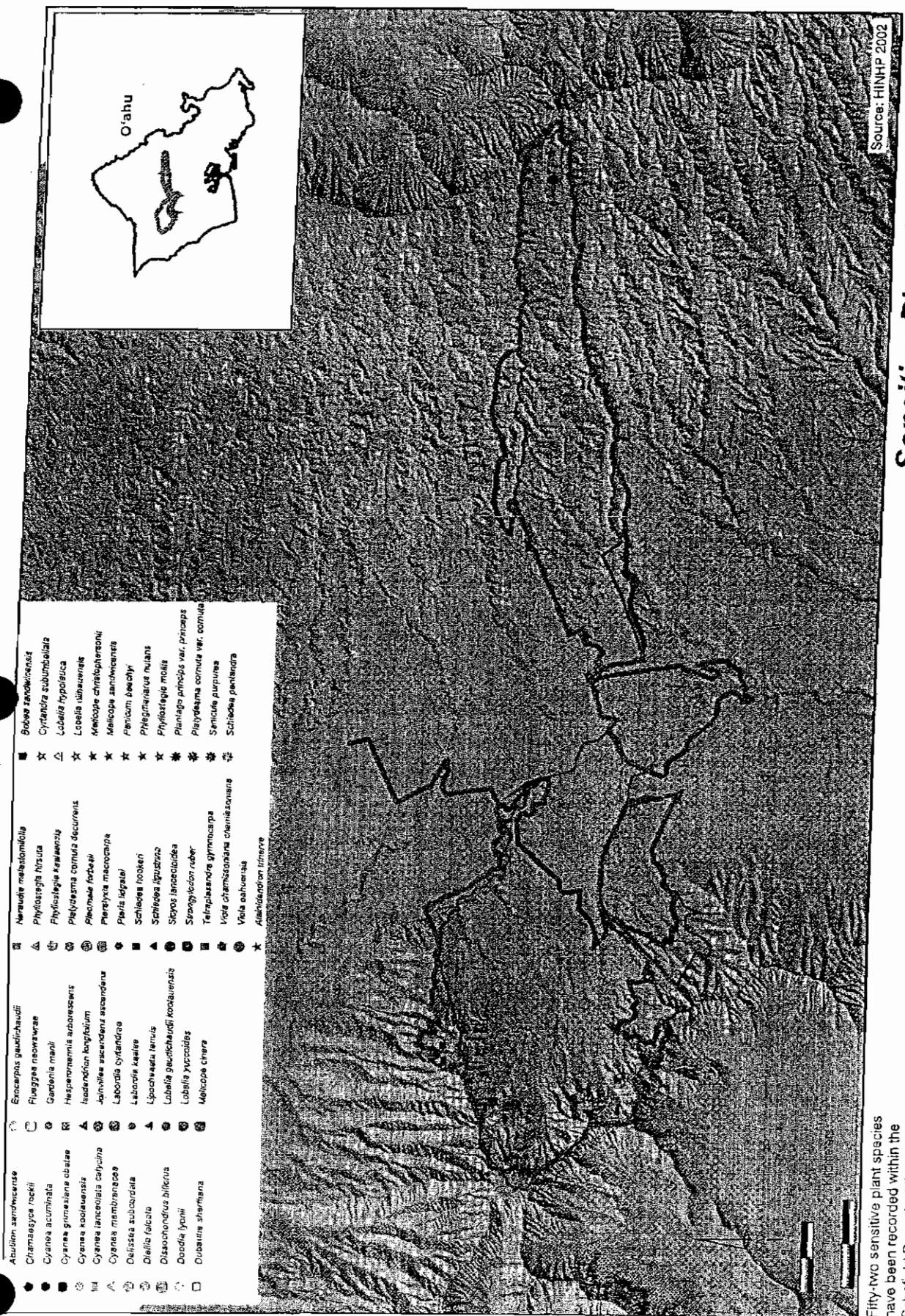
G3 = Species very rare with restricted range

Likelihood of occurrence on the project site

C = Confirmed

P = Potentially may occur

U = Unlikely to occur



R:\New\J397\GIS\Layer\Strategic\checklist\Plant Species.mxd - 02/19/04 - YE
Fifty-two sensitive plant species have been recorded within the Schofield Barracks Military Reservation Region of Influence.

Sensitive Plant Species in the Schofield Barracks Military Reservation Region of Influence
Source: HINRP 2002
O'ahu, Hawai'i
Figure 5-36

Table 5-24
Sensitive Terrestrial Wildlife Species Occurring or Potentially Occurring in the SBMR/WAAF ROI

Scientific Name	Hawaiian Name/Common Name	Federal Status	State ² /Global Status	Habitat	Date last Observed	Likelihood of Occurrence
Invertebrates						
<i>Achatinella apertiflava</i>	pūpū kuaikiwi, pūpū kani'oe, kāhuli/O'ahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 m)	1953	P
<i>A. hystroni/ lekipisau</i>	pūpū kuaikiwi, pūpū kani'oe, kāhuli/O'ahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 m)	2000	C
<i>A. leucostrophus</i>	pūpū kuaikiwi, pūpū kani'oe, kāhuli/O'ahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 m)	1989	C
<i>A. lili</i>	pūpū kuaikiwi, pūpū kani'oe, kāhuli/O'ahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 m)	-	P
<i>A. muriculata</i>	pūpū kuaikiwi, pūpū kani'oe, kāhuli/O'ahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 m)	2000	C
<i>A. seaverbyana</i>	pūpū kuaikiwi, pūpū kani'oe, kāhuli/O'ahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 m)	2000	C
<i>A. moffitti</i>	pūpū kuaikiwi, pūpū kani'oe, kāhuli/O'ahu tree snail -/Amastrid land snail	SOC	-/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 m) Areas with native vegetation, specific preferences not available	1970; 1966	P
<i>Anelasma glandricola</i>		SOC	-/G1	Areas with native vegetation, specific preferences not available	2001	C
<i>A. nicens</i>	-/Amastrid land snail	SOC	-/G1	Areas with native vegetation, specific preferences not available	1965	P
<i>A. pharizone</i>	-/Amastrid land snail	SOC	-/G1	Areas with native vegetation, specific preferences not available	1986	C
<i>Achatinellia emarginata</i>	-/Achatinellid land snail	-	-/G1	Areas dominated with native vegetation	1988	C
<i>A. sp. aff. castanea</i>	-/Achatinellid land snail	-	-/G1	Areas dominated with native vegetation	1966	P
<i>A. sp. aff. purpurascens</i>	-/Achatinellid land snail	-	-/G1	Areas dominated with native vegetation	-	P
<i>Coelostoma spp.</i>	-/Endodontid land snail	SOC	-/G1	Areas with native vegetation; specific preferences not available	2003	C
<i>Drosophila albinotata</i>	-/picture-wing fly	P	-/-	Scattered in moist and wet forests	2003	C
<i>D. obsoletai</i>	-/picture-wing fly	P	-/-	Scattered in moist and wet forests	2003	C
<i>Hydrellia unica</i>	/unique yellow-faced bee	SOC	-/-	Subalpine forest	-	P
<i>Tanymecilla tanymecilla</i>	-/Amastrid land snail	SOC	-/G1	Areas with native vegetation, specific preferences not available	2000	C
<i>Lepachatinia sp.</i>	-/Amastrid land snail	SOC	-/G1	Areas with native vegetation; specific preferences not available	-	P
<i>Lepachatinia sp. (O'ahu)</i>	-/Amastrid land snail	SOC	-/G1	Areas with native vegetation, specific preferences not available	1965	P

May 2004

Stryker Brigade Combat Team Final EIS, Hawaii

5-159

0051717

5.10 Biological Resources

Table 5-24
Sensitive Terrestrial Wildlife Species Occurring or Potentially Occurring in the SBMR/WAAF ROI (continued)

Scientific Name	Hawaiian Name/Common Name	Federal Status	State ² /Global Status	Habitat	Date last Observed	Likelihood of Occurrence
<i>Megalopismorihueensis</i>	-/O'ahu megalaugrin damselfly	SOC	-/G1	Breed in damp leaf litter	1958	P
<i>Parilisina dubia</i>	-/Achatinellid land snail	SOC	-/G1	Areas dominated with native vegetation	1948	P
<i>Planorboma sandiehenensis</i>	-/Heliacid land snail	SOC	-/G1	Areas with native vegetation; specific preferences not available)	1966	P
Birds						
<i>Aegotheleswallacei</i>	pūro/Hawaiian short-eared owl	SOC+	E*/G5T3	Paluress, grasslands, dry and wet forests that are dominated by either native or nonnative vegetation. Sea level to 7,900 feet (2,408 m).	1986	C
<i>Chasiempissandwichensis</i>	O'ahu 'elepaio/-ibidis	E, CH	E/G4T1	Native Hawaiian forest	2000	C
<i>Juncobiuscaeruleoventris</i>	O'ahu 'akepa/-wollettiabottnii	-	-/G2	Montane 'ōhi'a-koia forest above the 3,000 foot (914.4 m) level	1976	P
<i>Paroreomyzessquamata</i>	'alauahio/O'ahu creeper	E	E/G1	Native Hawaiian shrublands, forests, and bogs	1976	P
<i>Vireoleucophrys</i>	'iwi/Hawaiian honeycreeper	+	E*/G4	Native forests, especially 'ōhi'a (<i>Metrosideros</i>) forest	1998	C
Mammals						
<i>Lasiurusxintermedius</i>	-/Hawaiian hoary bat	E	E/G5T2	Bare rock, cliff, hardwood forest, grassland/terracuous, hardwood woodland, and riparian habitats.	1988	C

Sources: USARRAW and 25th IDLI 2001a; HDLNR 2002a; HINHP 1994; R. M. Towill Corp. 1997b; PCSU 2001; NatureServe 2001; Virginia Tech 1998

Notes:

NCN = No common name

*The state endangered listing refers only to the populations on O'ahu, Lanai, and Moloka'i.

- Not yet recorded within the SBMR/WAAF ROI

Status:

Federal:

H = Endangered

SOC = Species of concern

C = Candidate species for listing

CH = Critical habitat designated or proposed for designation

+ = Birds of Conservation Concern

State:

E = Listed as endangered

/- = No Status

Heritage Global Rank:

G1 = Species critically imperiled globally (typically 1-5 current occurrences)

G2 = Species imperiled globally (typically 6-10 current occurrences)

G3 = Species apparently globally secure

G4 = Species demonstrably globally secure

T1 = Subspecies critically imperiled globally (typically 1-5 occurrences)

T2 = Subspecies imperiled globally (typically 6-10 occurrences)

T3 = Subspecies either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range, or because of other factors making it vulnerable to extinction throughout its range (21-100 occurrences).

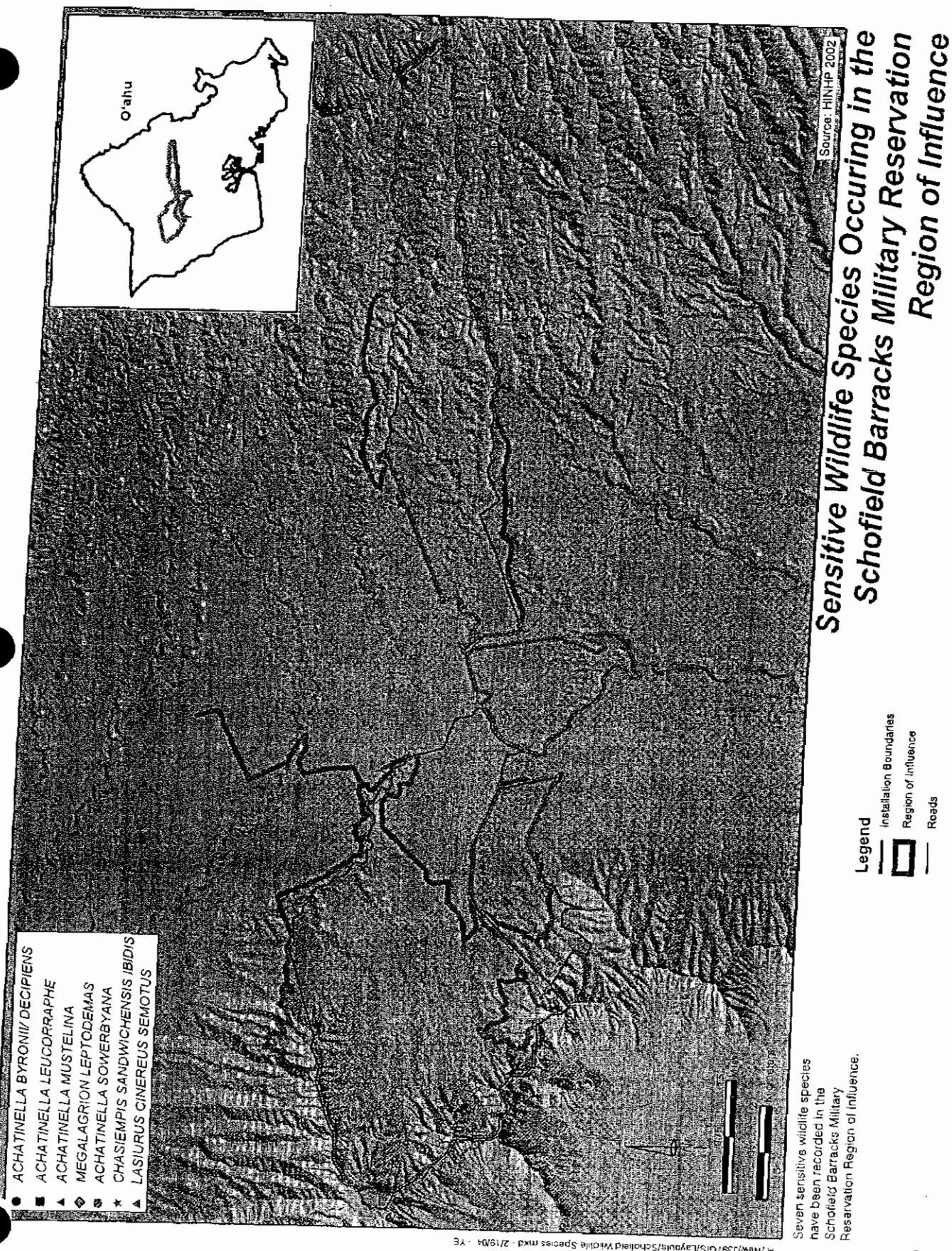
T4 = Subspecies apparently globally secure

Likelihood of occurrence on the project site

C = Confirmed

P = Potentially may occur

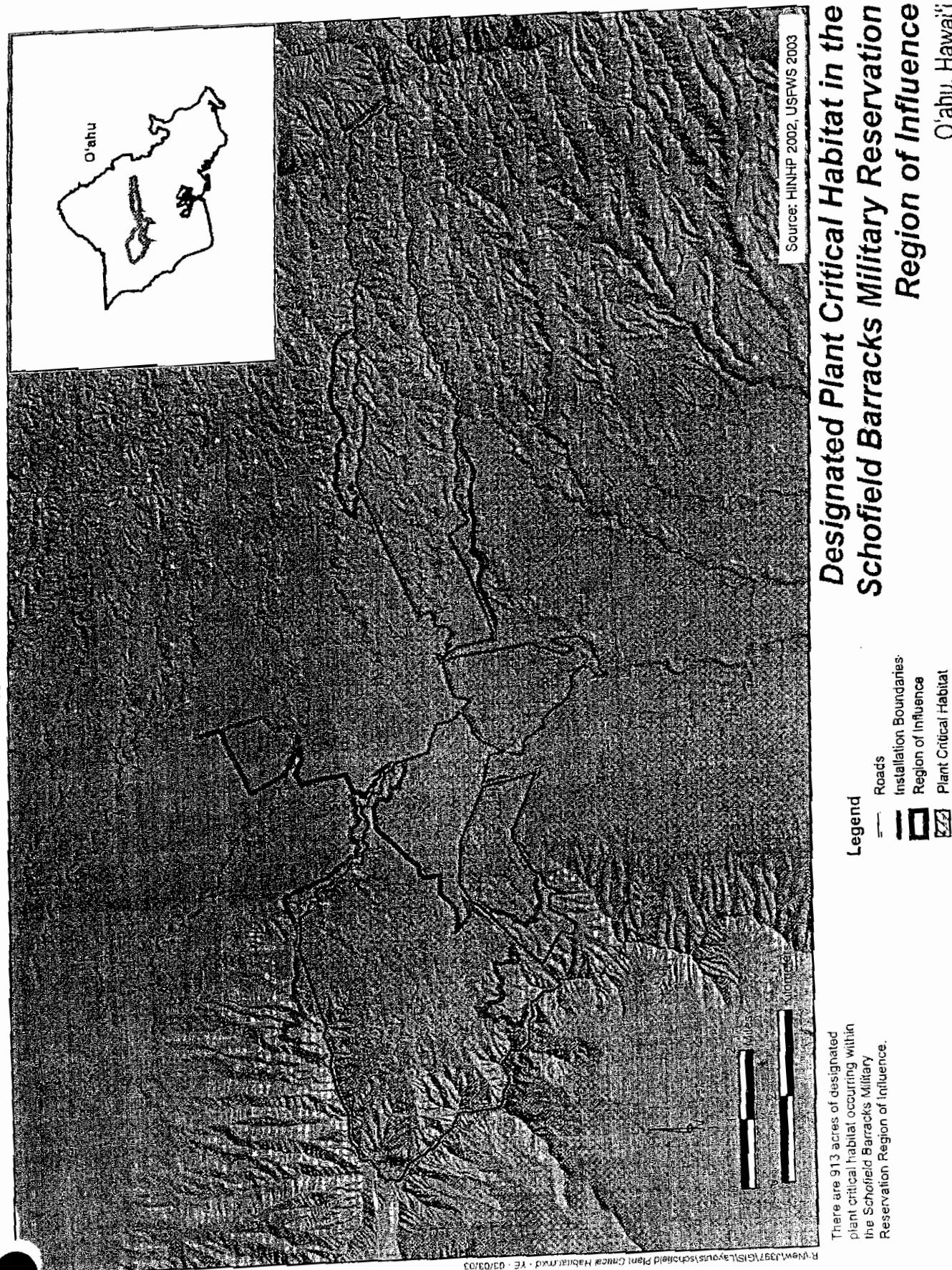
U = Unlikely to occur



5-161

0051719

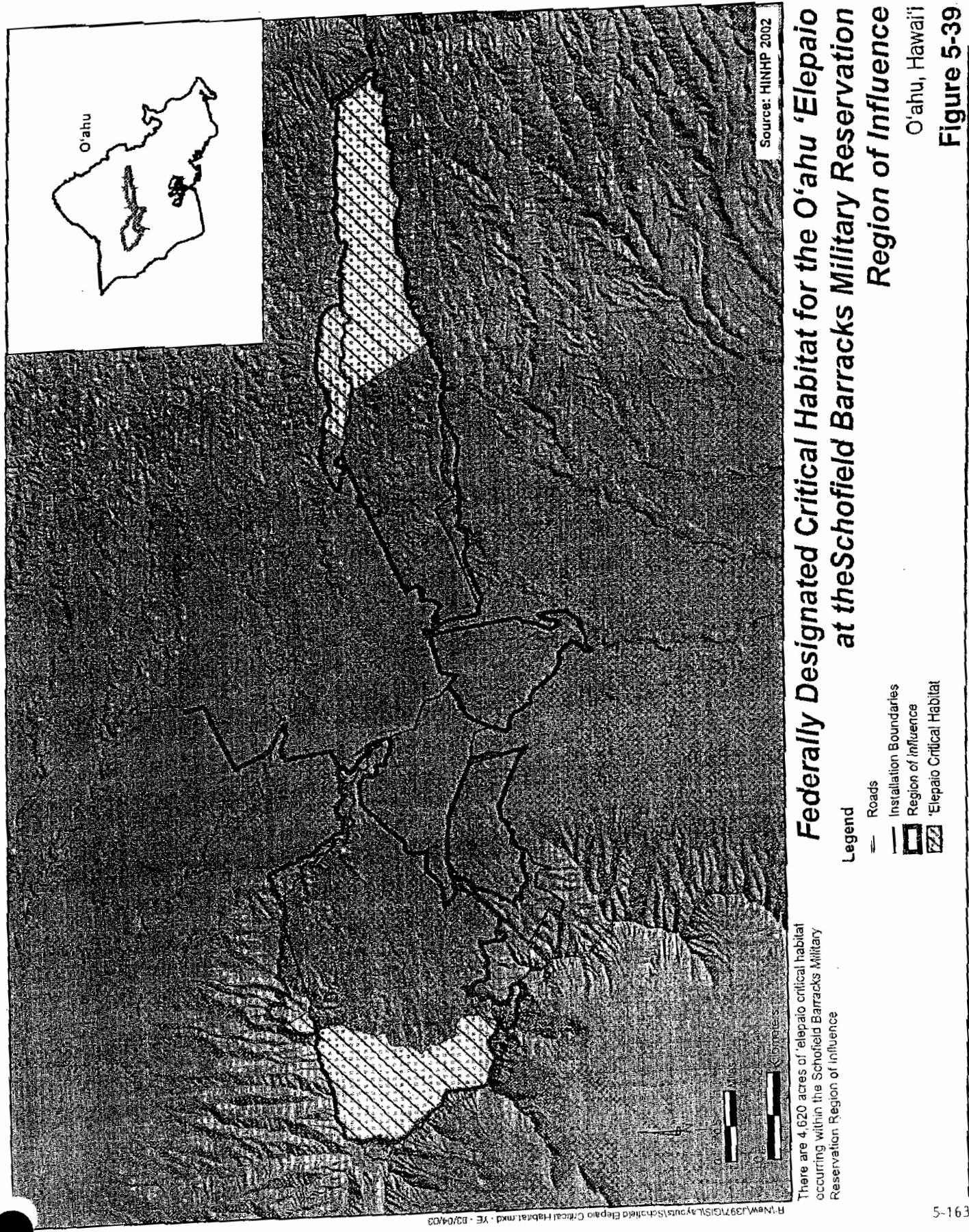
Figure 5-37



5-162

0051720

Figure 5-38



O'ahu, Hawaii

Figure 5-39

5.10 Biological ResourcesEcologically Sensitive Areas

Surveys done under the HINHP show eleven native natural vegetation communities on SBMR. These zones are determined by climate, topography, elevation and prevailing ecological conditions. The HINHP considers two of these vegetation communities to be rare with a HINHP rank of G1: the O'ahu diverse lowland moist forest and Loulu Hiwa lowland wet forest (HINHP 1994).

Three ecological zones have been identified in the SBMR survey area. The wet summit crest zone exists in areas above 3,000 feet (914 meters), along the tops of the Wai'anae and Ko'olau Mountains. This zone contains the globally imperiled Loulu Hiwa lowland wet forest. Cliffs and moderate slopes are the topographically dominant features in this cool, wet cloud-swept region.

Below this is the moist ridges and cliffs zone, which is warmer and drier than the wet summit zone, though it does not escape the winds. The vegetation community on this part of SBMR supports 'ōhi'a lowland moist shrubland and Kāwelu lowland moist grassland; these communities are not considered rare and have a Global Heritage Ranking of G3.

The third ecological zone exists below the steepest cliffs and slopes described above and along the ridge tops to the gulch bottoms; this is the lowland forest zone. Typically warm and moist to wet, there are three forest types in this zone. The koa/'ōhi'a lowland moist forest is predominant on ridge tops and in lower elevations; 'ōhi'a lowland wet forests and uluhe lowland wet shrubland are the dominant native natural communities. O'ahu diverse lowland moist forests occur on north-facing, moderately steep slopes, are considered rare, and have a Global Heritage ranking of G1.

Biologically Significant Areas (BSAs)

SBMR contains large expanses of native-dominated plant communities. These areas are defined to prioritize areas for management based on their relative richness of rare natural resources. The Hawai'i Natural Heritage Program has defined three types of biologically significant areas for managing the important natural communities (Figure 5-40). They are described below.

BSA1 contains a high density of federally listed endangered, proposed endangered, or candidate species. There are three noncontiguous areas in the Wai'anae area of SBMR that have the BSA1 designation, and all three areas are habitat for the endangered land snail *Achatinella mustelina* and several endangered plants. The southernmost BSA1 is near Pu'u Hāpapa and the Honouliuli Preserve. It is the habitat for over 20 native and protected plant species, in addition to the endangered snail. This area is in the zone of proposed acquisition for the Army firing range (QTR2) at SBMR. The Ko'olau Mountain area of SBMR has two areas defined as BSA1. These areas are both in the eastern portion of the range, near the summit crest, and contain several species of endangered plants.

BSA2 contains all or some of the following: lower densities of federally listed endangered or proposed endangered species; candidate species or other species of concern that are expected to be upgraded to federal protected status within the next few years; and areas judged likely

5.10 Biological Resources

to contain high densities of federally listed species, based on habitat assessment, despite the lack of any record of such occurrence to date. SBMR has two noncontiguous areas and one somewhat isolated area of habitat classified as BSA2. These regions contain typical vegetation for natural communities of moist ridges and cliffs and lowland forest zones. There is one BSA2 in the Ko'olau region of SBMR at East Range. It covers most of the eastern end of the range and is primarily a lowland forest. Most of the rare plants found in the Ko'olau range survey are in this area.

BSA3 contains stands of intact native vegetation with few or no known occurrences of rare elements. There is one BSA3 in the Waianae region of SBMR. There are no findings that support knowledge of natural communities in the area. Although there are no rare communities in the BSA3 area, the forest includes six native endangered plant species (*Cyanea grimseana*, *Gardenia mannii*, *Labordia cyrtandrae*, *Lycopodium nutans*, *Pteris hyggetei*, and *Tetraplasandra gymnocarpa*). The BSA3 designated range in the East Range/Ko'olau region contains *Gardenia mannii* and *Cyanea longiflora* but no rare natural communities. It is likely that with further surveys of the areas additional rare plant occurrences would be documented.

Also found within the ROI is sensitive snail habitat. Although this habitat has not been federally designated or proposed as critical habitat it has been identified as containing the habitat requirements necessary for supporting the federally listed and snail species of concern on O'ahu. This area is shown in Figure 5-40.

5.10.2 Environmental Consequences

In response to the agency and public comments received during the Draft EIS comment period we reevaluated our analysis of the biological resources. As a result of considering these comments and of reanalyzing the available information, we recognize that the impact on biological resources from fire could not be mitigated to the less than significant level. However, these impacts will be substantially reduced as a result of mitigation.

Summary of Impacts

Biological resources that have been considered include vegetation communities, wildlife, sensitive species, and sensitive habitats. All biological resources have been assessed for potential impacts from project activities. (For a full description of the impact methodology used to determine impact on a resource, please refer to chapter 4.10. Only the resources potentially affected are included in this chapter; if a resource was determined not to be affected, it was not included for discussion.) A summary of impacts is provided in Table 5-25. Significant impacts would occur on sensitive plants and habitat from wildfires sparked by military training activities. Significant impacts mitigable to less than significant would occur from construction and training on sensitive species and sensitive habitat from training activities and from the spread of nonnative species introduced by construction and troop movements. Less than significant impacts would occur relating to general vegetation and habitat from training activities and construction, threats to migratory birds from the construction of FTI antennas, and noise and visual effects on wildlife from construction and training activities.

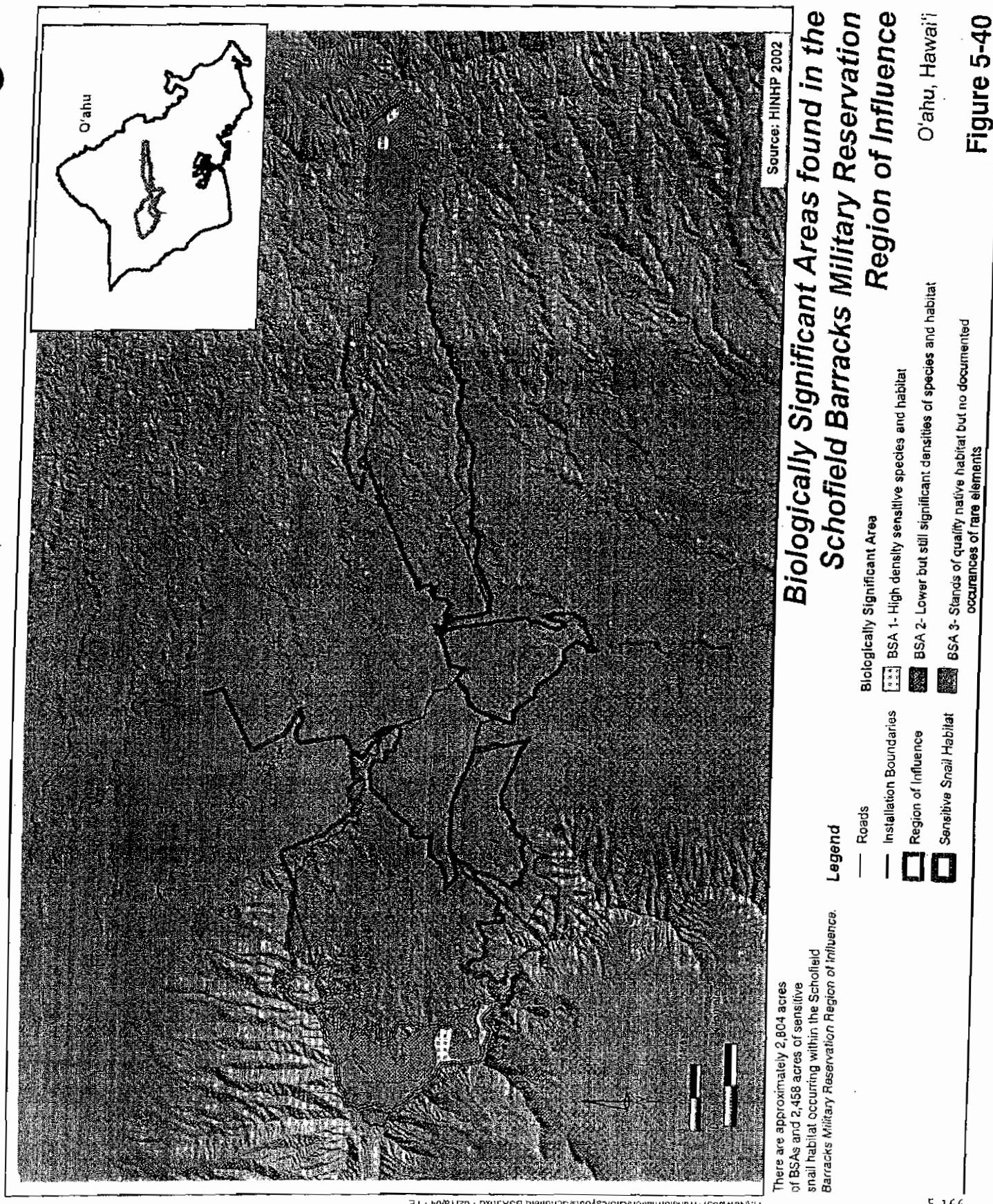


Figure 5-40

Proposed Action

Significant Impacts

Impact 1: Impacts from fire on sensitive species and sensitive habitat. Military training activities would increase the probability of wildfires and would increase the likely intensity of fires that occur. Wildfires that burn into native communities or sensitive habitats would destroy listed plant and animal species and sensitive habitats.

Table 5-25
Summary of Potential Biological Impacts at SBMR/WAAF

Impact Issues	Proposed Action	Reduced Land Acquisition	No Action
Impacts from fire on sensitive species and sensitive habitat.	⊗	⊗	⊗
Impacts from construction and training activities on sensitive species and sensitive habitat.	⊗	⊗	⊗
Impacts from the spread of nonnative species on sensitive species and sensitive habitat.	⊗	⊗	⊗
Impacts from construction and training activities on general habitat and wildlife.	○	○	○
Threat to migratory birds.	○	○	○
Noise and visual impacts.	○	○	○
Vessel impacts on marine wildlife and habitat.	N/A	N/A	N/A
Runoff impacts on marine wildlife and coral ecosystems.	N/A	N/A	N/A

LEGEND:

- | | |
|--|-----------------------|
| ⊗ = Significant | + = Beneficial impact |
| ⊗ = Significant but mitigable to less than significant | N/A = Not applicable |
| ○ = Less than significant | |
| ○ = No impact | |

The use of ammunition, weapon systems, and pyrotechnics during military training increases the risk of wildland fire ignition. Because natural sources of fire ignition are relatively rare in Hawai'i, many Native Hawaiian plants are not adapted to fire and are adversely affected by it. Nonnative species, particularly nonnative grasses and shrubs, typically invade areas after they have burned. This inhibits the regeneration of native plants. The removal of native species and the spread of nonnative species are significant adverse impacts associated with wildland fires.

Wildfires at SBMR are commonly caused by tracer fire and generally start in the impact area. Fire breaks surrounding the impact area can prevent wildland fires from escaping to undisturbed areas; however, fires do occasionally escape and are also occasionally started in other areas by other sources, such as cigarettes, vehicles, and other military activities. Wildland fires could spread and adversely affect biological resources throughout the ROI. Tracer rounds would be used at ranges within the Main Post but not within SBER or the SRAA, so the threat of fire there would be significantly lower than at the Main Post. The ranges at SBMR are designed so that all ammunition firing occurs within firebreak roads. Firing and mortar points are located to ensure that the maximum range of the weapon would not overshoot the impact area. For small arms ranges where tracer rounds are used, the ranges are laid out so that tracer burnout occurs before a round leaves the impact area. It is unlikely that wildfires would be ignited in areas not used for training because these areas are typically dominated by less flammable vegetation (this determination was developed during ESA Section 7 consultation).

The UAV would be used over much of the land area at SBMR but is not expected to affect biological resources during normal operation. However, due to the nature of the UAV, accidents would be possible and could cause wildfires.

In addition to vegetation loss, major adverse ecological effects of wildland fires include reduced watershed stability, soil erosion, increased risk of weed invasion, and loss of native habitat. Fires could destroy native plants and slow-moving animals, such as snails, and could displace mobile animals. BSAs within the ROI that could be affected by a wildfire are presented in Table 5-26. In addition, the following sensitive habitats are within the SBMR ROI: BSAs, federally designated critical habitat for O'ahu 'elepaio, and habitat used by numerous species of native Hawaiian land and tree snails. There is no assurance that fires or other threats associated with the Proposed Action would not reach or otherwise threaten populations of listed species within the SBMR ROI.

Table 5-26
BSAs within the ROI

Biologically Significant Areas	Main Post ROI (acres)	SRAA ROI* (acres)	SBER ROI (acres)
BSA-1	51	Not applicable	50.5
BSA-2	478.6	Not applicable	247.7
BSA-3	30.1	Not applicable	1,211.7

Source: R.M.Towill Corp 1997b.

*SRAA does not contain any BSAs

The sensitive plants at some risk from SBCT fire-related threats are māhoe (*Alectryon macrococcus* var. *macrococcus*), hāhā (*Cyanea griseana obatae*), *Delissea subcordata*, *Diellia falcata*, mehamehame (*Flueggea neowawraea*), *Hesperomeles arborescens*, aupaka (*Iosodendron longifolium*), *Lobelia cyrtandrae*, ānaunau (*Lepidium arboreum*), *Lobelia niihauensis*, *Phyllostegia mollis*, *P. kaalaensis*, ale, *Schiedea hookeri*, and 'olopū (*Viola Chamissoniana* ssp. *Chamissoniana*) (this determination was made during Section 7 Consultation).

The following sensitive wildlife are known to occur or are likely to occur in the ROI and are likely to be affected by the outbreak of a wildfire as the result of the Proposed Action: O'ahu 'elepaio, 'i'iwi, *Achatinella mustelina*, and the Hawaiian hoary bat. These species have been identified as occurring within areas of low to moderate fire risk and would be directly or indirectly affected through the loss of habitat disturbed by a fire outbreak. Impacts on these federally listed species are considered significant. However, the mitigation would substantially reduce the impacts.

Regulatory and Administrative Mitigation 1. The Army will implement all the terms and conditions defined in the Biological Opinion issued by USFWS for current force and SBCT proposed actions on O'ahu, including the O'ahu Implementation Plan. These measures will help avoid effects and will compensate for impacts on listed species that would result directly and indirectly from implementing the Proposed Action. The Biological Opinion is available upon request.

The IWFMP for Pōhakuloa and O'ahu Training Areas was updated in October 2003. The Army will fully implement this plan for all existing and new training areas to reduce the impacts from wildland fires. The plan is available upon request.

Significant Impacts Mitigable to Less than Significant

Impact 2: Impacts from construction and training activities on sensitive species and sensitive habitat. There would be long-term significant and mitigable impacts on sensitive (federally listed) species and their sensitive habitat, including on critical habitat, as a result of SBCT training activities. Listed species potentially affected by the project action include the following:

- Plants: *Abutilon sandwicense*, *Alectryon macrococcus* var. *macrococcus*, *Altinidendron trinerve*, *Chamaesyce rockii*, *Cyanea acuminata*, *C. grimesiana* spp. *obatae*, *C. koolauensis*, *Cyrtandra subumbellata*, *C. viridiflora*, *Delissea subcordata*, *Diellia falcata*, *Flueggea neowawraea*, *Gardenia mannii*, *Hesperomannia arborescens*, *Iosendrion longifolium*, *Labordia cyrtandrae*, *Lepidium arbuscula*, *Lobelia gaudichaudii* var. *koolauensis*, *L. nāhauensis*, *Pblegmariarus nutans* (*Lycopodium nutans*), *Phyllostegia hirsuta*, *P. kaalaensis*, *P. mollis*, *Plantago princeps* var. *princeps*, *Pteris lidgatei*, *Sanicula purpurea*, *Schiedea hookeri*, *S. kaalae*, *Tetraplasandra gymnocarpa*, *Viola chamissoniana* spp. *chamissoniana*, *V. oahuensis*; and
- Wildlife: *Achatinella apexfulva*, *A. byronii*, *A. decipiens*, *A. leucoraphe*, *A. kila*, *A. mustelina*, *A. sowerbyana*, *A. swifflii*, *Paroreomyza maculata*, *Lasius cinereus semotus*, *Chasiempis sandvicensis ibidis*, and the O'ahu 'elepaio.

The proposed locations of restricted road mounted maneuvers and dismounted training is the same area where listed species have been known to occur (Figures 5-34 and 5-35). It is also near the O'ahu 'elepaio's federally designated critical habitat, as well as designated plant critical habitat (Figures 5-38 and 5-39). There are 4.620 acres of O'ahu 'elepaio critical habitat within the SBMR ROI, and 155 'elepaio pairs and additional individuals have been identified within the SBMR ROI (HINHP 2002; see Figure 5-37). There are also 179.71 acres of plant critical habitat within the ROI. No impacts from construction activities are expected to occur

Table 5-29
Summary of Known Cultural Resources at Schofield Barracks Military Reservation, South Range
Acquisition Area, and Wheeler Army Air Field

	Total Archaeological Sites	Sites Listed, Eligible, or needing DE	Area Surveyed for Archaeological Sites	Buildings over 50 years Old	Buildings Listed, Eligible, or Needing DE
Main Post (SBMR, SBW, and SBS)	90	85 (DE)	820 acres (332 hectares)	439	177 listed 193 DE
SRAA	53	53 (DE)	120 acres (48.6 hectares)	None	Unknown
East Range	11	11 (DE)	890 acres (360 hectares)	Unknown	Unknown
WAAF	5	1 (DE)	50 acres (20.2 hectares)	273	7 listed 264 DE
Helemanō Trail	None	None	Unknown (entire easement)	0	0

Source: LARI 2003

Note: "DE" or "determination of eligibility" means a site or building that has not yet been found ineligible for the NRHP and therefore must be treated as eligible pending such a finding.

Table 5-30
Known Cultural Resources at Schofield Barracks Military Reservation, South Range Acquisition Area, and Wheeler Army Air Field

Location	State Site No.	Site Description
SBS	8-0214	Kolekole Stone
SBW	4-0212	Luakini fishpond
SBW	8-9516	Elou Cliff trail
SBW	50-80-04-0215	Haleauau heiau (destroyed)
SBW	50-80-04-0217	Heiau (destroyed)
SBW	50-80-08-0213	Kumakali'i heiau (destroyed)
SBE	50-80-09-0204	Single stone
SBMR	Schofield Barracks Historic District	
SBMR	Stockade	Historic building
SBMR	Fire Station	Historic building
SBS	50-80-08-5385	Road section
SBS	50-80-08-5386	Alignment
SBS	50-80-08-5387	Mound complex
SBS	50-80-08-5388	Tetrace/mound complex
SBS	50-80-08-5389	Terrace/mounds/align
SBS	50-80-08-5390	Mounds
SBS	50-80-08-5391	Terrace/mound/encl
SBS	50-80-08-5392	Agricultural fields
SBS	50-80-08-5393	Field terrace/betms/‘auwai
SBS	50-80-08-5394	Irrigation pondfield/‘auwai
SBS	50-80-08-5395	Historic road
SBS	50-80-08-5396	‘Auwai
SBS	50-80-08-5399	Alignments

Table 5-30
Known Cultural Resources at Schofield Barracks Military Reservation, South Range Acquisition Area, and Wheeler Army Air Field (continued)

Location	State Site No.	Site Description
SBS	50-80-08-5397	C-shape
SBS	50-80-08-5400	Terrace
SBS	50-80-08-5401	'Auwai
SBS	50-80-08-5407	Alignment
SBS	50-80-08-5408	'Auwai
SBS	50-80-08-5409	Road
SBS	50-80-08-5410	Stream terraces
SBS	50-80-08-5412	Mound
SBS	50-80-08-5413	Enclosure/align/mounds/walls
SBS	50-80-08-5414	Linear depression
SBS	50-80-08-5415	Dry land agricultural terraces
SBS	50-80-08-5416	Terraces/enclosure
SBS	50-80-08-5417	Terraces/mounds
SBS	50-80-08-5418	Agricultural complex
SBS	50-80-08-5419	Terraces with 'auwai
SBS	50-80-08-5420	Terrace/mound
SBS	50-80-08-5421	Irrigation agricultural complex
SBS	50-80-08-5422	Terrace/mound complex
SBS	50-80-08-5424	Mounds
SBS	50-80-08-5423	Agricultural complex
SBS	50-80-08-5425	Wall section
SBS	50-80-08-5426	Mounds
SBS	50-80-08-5427	Agricultural terrace complex
SBS	50-80-08-5428	Mounds
SBS	50-80-08-5429	Terrace/enclosure
SBS	50-80-08-5430	Mound
SBS	50-80-08-5431	Mound/L-shape
SBS	50-80-08-5432	Road alignment
SBS	50-80-08-5433	'Auwai
SBS	50-80-08-5434	Terrace/berms/'auwai
SBS	50-80-08-5435	Terrace/mounds
SBS	50-80-08-5436	Mounds/terraces
SBS	50-80-08-5437	Mound
SBS	50-80-08-5438	'Auwai
SBS	50-80-08-5439	Mound
SBS	50-80-08-5440	Mound
SBS	50-80-08-5441	Mound
SBS	50-80-08-5447	Terraces/'auwai
SBS	50-80-08-5448	enclosure/mounds/terrace
SBS	50-80-08-5449	Terraces/'auwai
SBS	50-80-08-5462	Roads
SBS	50-80-08-5505	Excavated ditch
SBS	50-80-08-5506	Alignment
SBS	50-80-08-5507	Rock shelter

Table 5-30
Known Cultural Resources at Schofield Barracks Military Reservation, South
Range Acquisition Area, and Wheeler Army Air Field (continued)

Location	State Site No.	Site Description
SBS	50-80-08-9528	Platform
SBW	50-80-04-0215	Halcaauau heiau
SBW	50-80-04-0216	House site
SBW	50-80-04-0217	Heiau
SBW	50-80-04-5379	'Auwai
SBW	50-80-04-5380	Terraces
SBW	50-80-04-5402	Terrace
SBW	50-80-04-5403	Field terracc complex
SBW	50-80-04-5404	Field terraces
SBW	50-80-04-5405	Field terraces
SBW	50-80-04-5406	Field terraces
SBW	50-80-04-5442	Alignments
SBW	50-80-04-5445	Terrace/mound agricultural complex
SBW	50-80-04-5446	Terraced field complex
SBW	50-80-04-5502	Wall
SBW	50-80-04-5503	Walled/terrace fields and berm
SBW	50-80-04-5512	Excavated ditch
SBW	50-80-04-5513	Irrigation field system
SBW	50-80-04-5514	Mound and enclosure
SBW	50-80-04-5515	Mound
SBW	50-80-04-5516	Mound
SBW	50-80-04-5517	Mounds
SBW	50-80-04-5518	Wall
SBW	50-80-08-0213	Kumakali'i heiau
SBW	50-80-08-5381	Terraces
SBW	50-80-08-5443	Tunnel
SBW	50-80-08-5444	Terrace/align
SBW	50-80-08-9516	Trail
SBW	50-80-08-9527	Walled/terrace
SBW	*50-80-04-215	<u>Hale'au'au heiau</u>
SBW	*50-80-04-216	<u>Enclosure</u>
SBW	*50-80-04-217	<u>Kalena Gulch heiau</u>
SBW	50-80-04-5379	Excavated ditch
SBW	50-80-04-5380	Field complex
SBW	50-80-08-5381	Field complex
SBW	50-80-08-5392	Field complex
SBW	50-80-08-5393	Field complex
SBW	50-80-08-5394	Field complex
SBW	50-80-08-5395	Alignment
SBW	50-80-08-5396	Excavated ditch
SBW	50-80-08-5432	Alignment
SBW	50-80-08-5433	Excavated ditch
SBW	50-80-08-5434	Field complex
SBW	50-80-08-5447	Field complex

Table 5-30
Known Cultural Resources at Schofield Barracks Military Reservation, South Range Acquisition Area, and Wheeler Army Air Field (continued)

Location	State Site No.	Site Description
SBW	50-80-08-5449	Field complex
SBW	50-80-04-5512	Excavated ditch
SBW	50-80-04-6552	Terrace
SBW	50-80-04-6553	Terrace
SBW	50-80-04-6554	Terrace complex
SBW	50-80-04-6555	Mounds
SBW	50-80-04-6556	Concrete structure
SBW	50-80-04-6557	Terrace complex
SBW	50-80-04-6558	Rock piling
SBW	50-80-04-6559	Alignment
SBW	50-80-04-6560	Terrace complex
SBW	50-80-04-6561	Terrace complex
SBW	50-80-04-6562	Alignment-mound complex
SBW	50-80-04-6563	Enclosure
SBW	50-80-04-6564	Terrace
SBW	50-80-04-6565	Terrace complex/petroglyph
SBW	50-80-04-6566	Ditch
SBW	50-80-04-6567	Retaining walls
SBW	50-80-04-6568	Concrete structure-rock piling
SBW	50-80-04-6569	Ditch
SBW	50-80-04-6570	Stone structure/road/ditch
SBW	50-80-04-6571	Retaining wall
SBE	50-80-09-0204	Single stone
SBE	50-80-09-5382	Tunnel/bunker
SBE	50-80-09-5383	Terrace
SBE	50-80-09-5384	Reservoir/ditch/tunnel
SBE	50-80-09-5411	Pecked boulder
SBE	50-80-09-5461	Concrete foundation
SBE	50-80-09-5500	Foundation/structure
SBE	50-80-09-5501	Foundations
SBE	50-80-09-5508	Foundation
SBE	50-80-09-5509	Reservoir
SBE	50-80-09-5510	Foundation
SBE	50-80-09-5511	Foundation
SRAA	9528	Platform
SRAA	5436	Terrace/mound complex
SRAA	5437	Mound
SRAA	5438	Excavated ditch
SRAA	5439	Mound
SRAA	5440	Mound
SRAA	5441	Mound
SRAA	50-80-08-5436	Feature complex
SRAA	50-80-08-5437	Mound
SRAA	50-80-08-5438	Irrigation ditch

Table 5-30
Known Cultural Resources at Schofield Barracks Military Reservation, South Range Acquisition Area, and Wheeler Army Air Field (continued)

Location	State Site No.	Site Description
SRAA	50-80-08-5439	Mound
SRAA	50-80-08-5440	Mound
SRAA	50-80-08-5441	Mound
SRAA	50-80-08-6462	Dam complex
SRAA	50-80-08-6463	Feature complex
SRAA	50-80-08-6464	Concrete foundation
SRAA	50-80-08-6465	Artifact scatter
SRAA	50-80-08-6466	Road retaining wall
SRAA	50-80-08-6467	Feature complex
SRAA	50-80-08-6468	Concrete foundations
SRAA	50-80-08-6469	Feature complex
SRAA	50-80-08-6470	Culvert system/ road
SRAA	50-80-08-6471	Road retaining wall
SRAA	50-80-08-6472	Feature complex
SRAA	50-80-08-6473	Wall with mounds
SRAA	50-80-08-6474	Building complex
SRAA	50-80-08-6475	Feature complex
SRAA	50-80-08-6476	Cistern
SRAA	50-80-08-6477	Feature complex
SRAA	50-80-08-6478	Habitation complex
SRAA	50-80-08-6479	Feature complex
SRAA	50-80-08-6480	Cistern
SRAA	50-80-08-6481	Feature complex
SRAA	50-80-08-6482	Feature complex
SRAA	50-80-08-6483	Feature complex
SRAA	50-80-08-6484	Mound complex
SRAA	50-80-08-6485	Feature complex
SRAA	50-80-08-6486	Feature complex
SRAA	50-80-08-6487	Enclosure
SRAA	50-80-08-6488	Mound complex
SRAA	50-80-08-6489	Retaining wall
SRAA	50-80-08-6490	Wall
SRAA	50-80-08-6491	Mound complex
SRAA	50-80-08-6492	Feature complex
SRAA	50-80-08-6493	Platform
SRAA	50-80-08-6494	Feature complex
SRAA	50-80-08-6495	Building complex
SRAA	50-80-08-6496	Mound
SRAA	50-80-08-6497	Complex
SRAA	50-80-08-6498	Alignment

Table 5-30
Known Cultural Resources at Schofield Barracks Military Reservation, South Range Acquisition Area, and Wheeler Army Air Field (continued)

Location	State Site No.	Site Description
SRAA	50-80-08-t100	Feature complex
SRAA	50-80-08-t101	Feature complex
SRAA	50-80-08-t102	Feature complex
WAAF	N/A	Historic landmark
WAAF	N/A	Historic district

Notes: SBS = Schofield Barracks South Range; SBE = Schofield Barracks East Range; SBW = Schofield Barracks West Range; SBMR = Cantonment area.

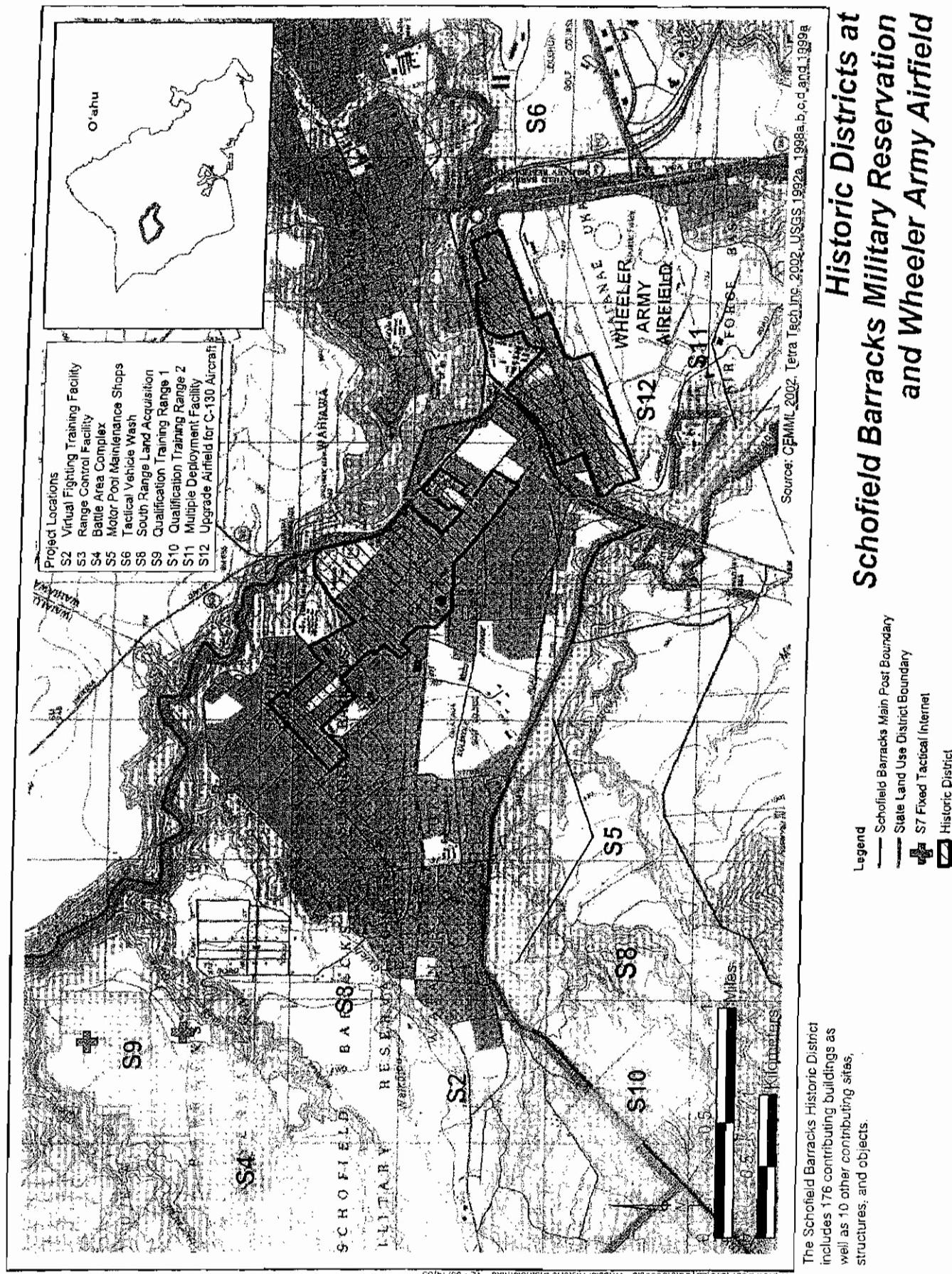
* Recent surveys could not re-locate these sites.

Source: IARII 2003; GANDA 2003e

Archaeological sites dating to the military use of the cantonment include three underground structures, a deposit of 20th century trash along the upper edge of Wai'eli gulch (Bouthillier et al. 1995), railroad remains northwest of McMahon Road (McIntosh et al. 1995a), a terrace facing of large angular basalt boulders at the edge of Wai'eli Stream at the southern edge of Martines Field (Williams et al. 1995), and a buried 5-cm-thick basalt gravel and asphalt paving, located along Wilson Avenue near its intersection with Cadet Sheridan Road (Tomonari-Tuggle 1997, 52-53). Five archaeological sites have been identified within the cantonment area, all of them related to military use of the property (IARII 2003). These have not been recommended as eligible to the NRHP. The four intensive surveys covering 177 acres (71.6 hectares) of the cantonment area recorded no prehistoric sites.

SBER is evaluated as an area of low probability for archaeological resources because much of it has been affected by erosion and ground disturbing activities and unaffected areas yielded few archaeological sites (Anderson 1998, 3-39). Pedestrian surveys documented 11 archaeological sites in SBER: two Native Hawaiian sites (a pecked boulder and a terrace with aligned stones) and nine historic military sites (three small complexes of structures, one concrete structure, three concrete foundations, a tunnel/bunker, and a reservoir/ditch/tunnel complex) (Robins and Spear 2002a, 8-9, 2002b, 8). All sites are recommended as eligible for National Register listing under criterion D.

Twenty-nine archaeological sites have been identified in the Schofield Barracks West Range (Robins and Spear 2002b). Of these, 24 are prehistoric and early historic Native Hawaiian sites, two are Native Hawaiian historic period sites, two are historic sites, and one is of unknown age. The sites of Native Hawaiian origin include heiau, agricultural terraces, 'auwai (irrigation channels), fishponds, enclosures, stone alignments, and roads. Most are located in the stream gulches. Robins and Spear (2002a, 2002b) recommend that all 29 sites be considered eligible for NRHP listing.



0051750

Figure 5-41

The SRAA has been completely surveyed for the presence of cultural resources. A large portion of the land in the eastern and southern portions of the parcel is under intensive pineapple cultivation. Seven sites had been previously recorded in the SRAA. Rosendahl (1977) recorded Site 50-80-08-9528, a possible historic platform. Robins and Spear (2002a, 198-203) recorded Sites 50-80-08-5436 to -5441, which consist of dry land agricultural mounds and terraces. These sites are associated with late prehistoric agricultural activities and possibly with cattle ranching. In 2002, GANDA completed survey work in the SRAA and identified forty-six sites (GANDA 2002b).

The Schofield Barracks South Range has a total of 53 known archaeological sites. These consist of 45 traditional Native Hawaiian prehistoric or early historic sites, five historic period sites, one military site, and two sites of unknown period. Most sites are located in the stream gulches where they are at least partially protected from the impact of training activities on the plateau lands above (Anderson 1998, Robins and Spear 2002a, 2002b). While investigating sites recorded in previous archaeological work, IARII discovered three additional sites.

BAX / QTR 1 / McCarthy Flats

A survey in 2003 (GANDA 2003c) revealed twenty new sites in the BAX/QTR1 project area. Three previously recorded sites (50-80-04-215, -216, and -217) could not be re-located. This brings the total of sites identified to 34, including the 14 previously identified sites. Thirteen of the newly discovered sites appear to be traditional Hawaiian, with four possibly dating to the historic era. Tentative functional determinations include habitation (Sites 6561, 6565 and 6568), irrigation (Site 6566), animal husbandry (Site 6563), and wetland and dryland agriculture (Sites 6552, 6554, 6555, 6557, 6559, 6560, 6562, 6564, and 6565). Petroglyphs were also identified at Site 6565 adjacent to a habitation structure. The Site 6560 complex was not recorded during the survey because it is in an area deemed off-limits due to the presence of high explosive 40mm ordnance. Several isolated artifacts were collected from the upper plateaus, including three poi pounders, two *u'u maika* (gaming stones), and an adz fragment.

The remaining seven sites are from the historic period: an irrigation ditch (Site 6569), erosion control walls (Sites 6567 and 6571), a WWII military bunker (Site 6556), and roads (Sites 6553 and 6570). Site 6570 also includes a water collection or distribution station. Site 6558 is a remnant stone structure containing historically cut stones.

Of the 34 sites, four wetland agricultural complexes (Sites 5392 to 5394 and 5396) and one wetland agricultural complex in Hale'au'au Gulch (Site 6565) are recommended for preservation. The remaining 29 sites are recommended for additional work to determine significance.

Wheeler Army Airfield

WAAF contains a National Historic Landmark, which includes a portion of the apron, a barracks building, five hangars, and one support facility (Figure 5-41). All housing at WAAF dating from 1932 to 1950 has been found to be NRHP eligible. An NRHP nomination form has been prepared for the Wheeler Historic District, which includes 242 eligible buildings.

Five historic archaeological sites have been identified on the installation; one is considered eligible for the NRHP (Tomonari-Tuggle and Bouthillier 1994). Surveys at WAAF to upgrade it for C130 Aircraft (S14) and at the Multiple Deployment Facility (S13) did not reveal any cultural resources.

Helemanō Trail

Recent survey work by GANDA in 2003 did not reveal any archaeological sites within or near the HMR easement. Sites in the general area were recorded by Fankhauser who found historic agriculture and historic communication sites having to do with HMR's use as a communication facility during World War II. Although no sites or other cultural resources within the estimated boundaries of the Helemanō Trail easement are known, Fankhauser did record an earth oven exposed in a plantation irrigation trench outside of HMR (Fankhauser 1987).

Potential for Unknown Resources

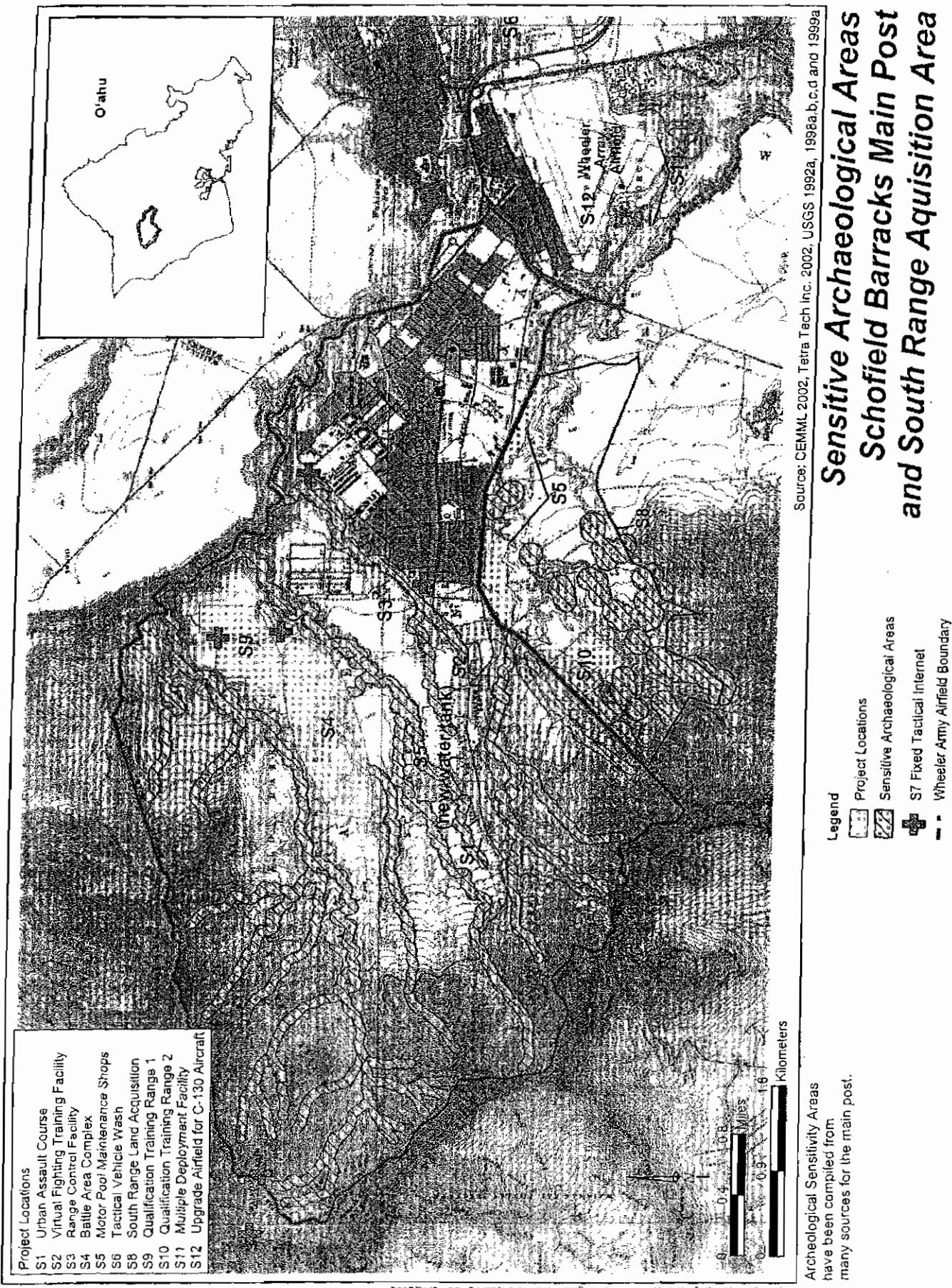
Archaeological sensitivity maps of SBMR have been compiled from several sources (Figures 5-42, 5-43). Possible railroad tracks are located to the northwest of McMahon Road on the upper edge of Waikōloa Gulch (IARII 2003). The whole northern edge of the SBMR cantonment area, including the McMahon parcel, is identified as a potentially sensitive archaeological area. Both Belt Collins (2000b) and Tomonari-Toggle (1997) identify undeveloped portions of Kaukonahua Gulch within the Schofield Barracks cantonment area as an archaeologically sensitive area (IARII 2003). A 1911 map reproduced in Robins and Spear (2002a, Figure 17, from Gomes [1911]) indicates that there is a burial site in Kaukonahua Gulch; any surveys in that area should include oral historical research on the possibility of burials (IARII 2003).

5.11.2 Environmental Consequences

Summary of Impacts

Table 5-31 summarizes impacts on cultural resources. Significant impacts on archaeological resources would occur from range and facility construction and from training activities. Additional significant impacts on ATIs would occur from facility construction and use of the SRAA for training activities. The significant impacts primarily relate to the construction phase of SBCT-related projects and range uses in the West and South ranges, the BAX, and the SRAA. As explained in the mitigation sections below, the severity of these impacts will be mitigated by implementing the PA found in Appendix L.

Mitigation measures include surveys, avoidance of archaeological sites and properties of importance to Native Hawaiians. Mitigation measures for demolition of or damage to eligible historic buildings will include following the Secretary of the Interior's standards during rehabilitation or documentation of eligible buildings in compliance with established federal standards.



Oahu, Hawaii

Figure 5-42



Figure 5-43

Table 5-31
Summary of Potential Cultural Resources Impacts at SBMR/WAAF

Impact Issues	Proposed Action	Reduced Land Acquisition	No Action
Impacts on historic buildings	○	○	○
Impacts on archaeological resources from range and facility construction	⊗	⊗	○
Impacts on archaeological resources from training activities	⊗	⊗	○
Impacts on archaeological sites from construction of fixed tactical internet	○	○	○
Impact on ATIs	⊗	⊗	○
Impacts on archaeological sites from road or trail construction	○	○	○
Impacts on archaeological sites from road use	○	○	N/A

In cases when there would be both beneficial and adverse impacts, both are shown on this table. Mitigation measures would only apply to adverse impacts.

LEGEND:

- | | |
|--|-----------------------|
| ⊗ = Significant | + = Beneficial impact |
| ⊖ = Significant but mitigable to less than significant | N/A = Not applicable |
| ○ = Less than significant | |
| □ = No impact | |

Less than significant impacts include the risk to undiscovered archaeological sites in areas of low potential for subsurface archaeological resources, the risk to sites from FTI construction, and the risk to historic architecture and landscapes from installation of cables and conduits. These impacts will be mitigated by complying with the Secretary of the Interior's Standards for Rehabilitation of Historic Buildings, as described in the PA in Appendix J.

Proposed Action (Preferred Alternative)

Significant Impacts

Impact 1: Impacts on archaeological resources from range and facility construction. Facility and range construction involves grubbing vegetation, grading site surfaces, excavating subsurface, and moving heavy construction equipment. All of these activities, particularly excavation, could result in direct damage to or destruction of archaeological resources.

SBMR contains numerous significant archaeological sites. USARHAW will conduct the mitigations described below in accordance with the PA, which will reduce the severity of these impacts but not to less than significant levels.

Regulatory and Administrative Mitigation 1. Before construction, the Army will complete the evaluation of any archaeological sites within areas subject to range and facility construction. Sites determined to be eligible for the NRHP will be flagged for avoidance. The projects will be designed to avoid all eligible and unevaluated archaeological sites, to the full extent practicable. GIS and GPS information will be given to project designers and range control to ensure that sites are considered in project design. If it is not possible to avoid archaeological sites, the Army will consult in accordance with the PA to determine the appropriate mitigation for the damage to the sites, such as data recovery or other mitigation measures. To address the accidental discovery of archaeological sites, human remains, or cultural items, the Army has developed an IDP as part of the PA.

Impact 2: Impacts on Areas of Traditional Importance. SRP (2003) conducted a TCP survey, as defined in Section 3.11.2, at SBMR, including the associated ranges. Archaeological surveys of construction areas and the range areas may not have identified TCPs or places of traditional importance to Native Hawaiians, even though some archaeological sites may constitute an ATI. Activities relating to the construction of the BAX, UACTF, and QTR1, and the use of QTR2, could result in destruction or damage, or restrict access to previously unknown properties of traditional importance to Native Hawaiians. Native Hawaiians consider range and training activities inappropriate and disrespectful uses of the land that disturb and change the character and feeling of spiritual places.

Acquisition of the SRAA and its subsequent use for military training could interfere with Native Hawaiian access to and use of sites on the parcel for traditional or religious purposes. Oral testimony indicates there are ATIs on the property, and some of these resources qualify as TCPs. Converting the area to military training purposes could result in limited Native Hawaiian access to some sites and might result in inadvertent physical damage or destruction of the sites. In order to protect such resources, a survey of the proposed construction and range areas for TCPs or ATIs has been conducted via pedestrian survey, archival research, oral interviews, and site visits with knowledgeable Native Hawaiians. USARHAW is taking a proactive role in trying to identify ATIs through its community outreach programs and activities, and plans to continue with these activities. Two FTI antenna support structures will be placed on Mount Ka'ala and one near Kolekole Pass. While the proposed FTI antenna support structures have been located to avoid archaeological resources, these areas have been identified as important elements of the cultural landscape of Wai'anae Uka. While the Kolekole antenna would be erected on top of an existing antenna support structure, the Mount Ka'ala sites would require new construction and may be considered to have an adverse visual effect.

Noise impacts described in Section 5.6 of this chapter would not have an impact on potential ATIs at Mount Ka'ala and Kolekole Pass because the noise contour maps show no noise impacts in these areas, and access would be limited to times when no ordnance would be firing.

Construction of the UACTF is identified for an area near Kolekole Pass, on or adjacent to the Elou Cliff Trail, a traditional trail identified as a potential ATI. Previous reconnaissance

surveys have failed to identify any remnants of the trail. The mitigation measures below will reduce the severity of the impact but not to less than significant levels.

Regulatory and Administrative Mitigation 2. Facility construction or training area uses will be designed to avoid identified traditional places and to limit visual impacts on TCPs by site location, design, and orientation, where feasible. If it is not possible to avoid identified TCPs or ATIs because of interference with the military mission or risk to public safety, the Army will consult with the SHPO and Native Hawaiians in accordance with the PA to identify impacts and to develop appropriate mitigation measures. Mitigation for impacts on the cultural landscape could include consulting with Native Hawaiians and having construction overseen by a cultural monitor.

The Army will continue to provide Native Hawaiians with access to traditional religious and cultural properties, in accordance with AIRFA and Executive Order 13007, on a case-by-case basis. This access program will be expanded to include new land acquisitions.

The Army previously identified Native Hawaiian burial sites in the SBCT ROI. The Army completed notification and consultation for these burial sites, in accordance with NAGPRA, and left these human remains in place. To address any impacts on any burial sites, or an inadvertent discovery of Native Hawaiian human remains or funerary objects, the Army will abide by all notification and consultation requirements outlined in Section 3 of NAGPRA.

Significant Impacts Mitigable to Less than Significant

Impact 3: Impacts on archaeological resources from training activities. Use of the BAX, the UACTF, and the new training areas in the SRAA could result in significant adverse impacts on archaeological resources.

Over 50 archaeological sites have been identified within the SRAA, the BAX contains over 30 sites, and the UACTF is known to be located in an area with possible cultural resources (Elou Cliff Trail). Potential impacts from the proposed training activities include damage to sites from subsurface excavations related to troop training (e.g., field fortifications, emplacement of obstacles), increased access by ground troops into the two ranges, off-road vehicular movement, possible damage from live fire. Maneuver training using tactical vehicles within the training areas would have a high potential to damage sites. The presence of large numbers of personnel could affect resources through vandalism or accidental damage.

Additionally, as discussed under geological resources, Strykers exert a greater amount of force on the ground than do vehicles previously used on training areas at SBMR. Off road mounted maneuvers with Strykers could result in greater direct impact on any remaining archaeological sites in all of the training areas, or in greater indirect impacts through contribution to erosion, as compared with No Action. At least 80 archaeological sites or distinct features have been identified in the West and South ranges (not including the SRAA); while these sites may have been affected by the existing uses of the training areas, use of the Strykers may cause more extensive damage. Implementation of the mitigation measures below would reduce significant impacts to less than significant levels.

historical military significance. During the survey by McGerty and Spear (2001), several historic features were recorded, including a loading dock and 11 runway, taxiway, and apron surfaces (IARII 2003). GANDA conducted the first survey of the proposed easement for Dillingham Trail (GANDA 2003b), and they recorded five historic period sites within the corridor. The sites included the Wilson Ditch, an irrigation ditch dated to the early part of the 20th century, the Halstead Mill, consisting of a basalt and mortar smokestack dated to the last part of the 19th century, and three historic bridges constructed in 1952 (GANDA 2003b).

Table 6-22 provides an overview of prehistoric and historic archaeological sites identified at DMR and their NRHP status. Archaeological sites identified on the installation include seven traditional Hawaiian (prehistoric and early historic) sites, 11 historic agricultural or military sites, and six military sites (Table 6-23) (IARII 2003; GANDA 2003a). Sixteen sites were recommended as eligible for listing on the NRHP, although two buildings (building numbers 30 and 33) of the Nike-Hercules Missile Battery (Site 5492) were demolished in 1997 (McGerty and Spear 2001). No evaluation has been made of the three sites found during the 2002 survey. Twenty-one military structures on Dillingham are over 50 years of age (Table 6-24). These are all World War II military facilities built in 1942 and should be evaluated for their eligibility for the NRHP. They include air raid/fallout shelters, air field aprons and runways, and range support facilities (IARII 2003). Twelve other structures build during the Cold War era have not yet been evaluated as potentially significant Cold War properties.

Table 6-22
Summary of Known Cultural Resources at DMR

Archaeological Sites	Sites Listed, Eligible, or needing DE	Area Surveyed for Archaeological Sites	Buildings over 50 Years Old	Buildings Listed, Eligible, or Needing DE
Dillingham and Dillingham Trail	24	24 (DE)	100%	21

Source: IARII 2003, GANDA 2003b

Potential for Unknown Resources

Sites in the flat northerly areas of DMR tend to be of historic military significance and are in areas that have been highly disturbed by modern agriculture and runway construction. However, since this area was heavily used in prehistoric and early historic times, there is a possibility of buried archaeological sites, particularly in areas unaffected by modern land use (Handy 1940; Handy and Handy 1972; Rosendahl 1977). Sand deposits in portions of DMR may contain burials, as these have been found in dune deposits on the coastal side of Farrington Highway (Bath 1987). Figure 6-19 shows archaeological sensitivity areas at DMR.

Table 6-23
Archaeological Sites at DMR

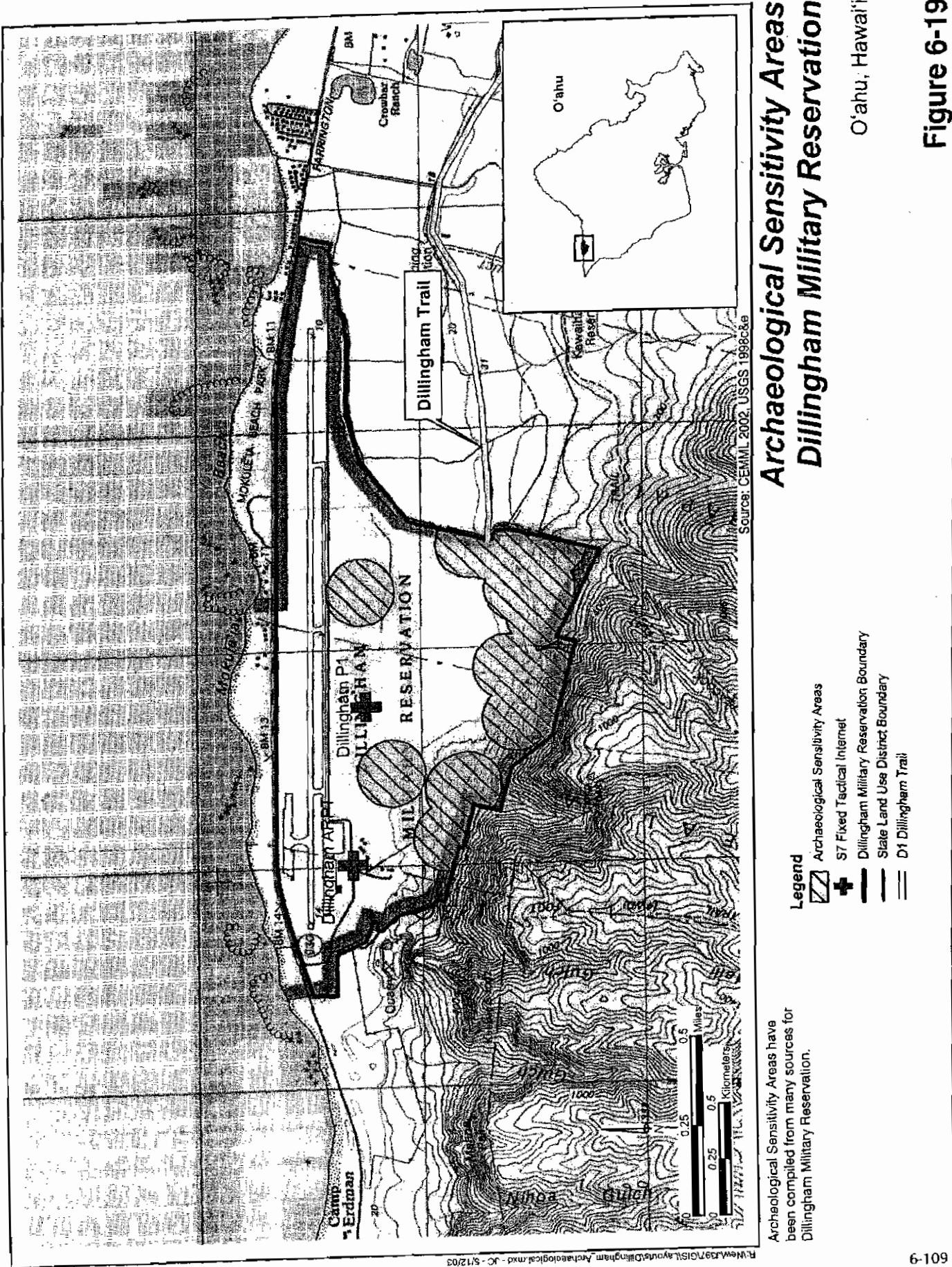
Site No.	Description	Use	Period
191	Paved platforms, terraces, Kawaihoa Heiau	Religious	Prehistoric
416	Terraces, stacked stone walls, walled enclosures, Keālia-Kawaihāpai Complex	Agriculture	Prehistoric/historic
5479	Concrete buildings (2)	Communication	WW II
5480	Wooden structure	Cattle chute	Ranching
5481	Cement structures (4)	Waste water	Military
5482 **	Cement-lined well	Agriculture	Historic
5483	Terraces, walls, mounds	Habitation, agriculture, ranching	Traditional, historic
5484	Terraces, modified boulders	Traditional agriculture, temporary habitation, historic	Traditional, historic
5485	Terraces, enclosures, walls	Agriculture, ranching	Traditional, historic
5486	Terraces, modified overhangs, walls	Temporary habitation, agriculture	Traditional
5487	Terraces, roads	Military, early agriculture	Historic
5488	Roads, cement structures	Military	WW II, 1960s
5489	Cement, basalt structures	Military	1940s-1970s
5490	Excavated channels	Water control	Historic
5491	Terraces, modified wet cave	Agriculture	Traditional, historic
5492	Concrete buildings (2)	Nike missile installation	1960s
D1	Underground cement tank	Military	Historic
D2	Cement foundation	Military	Historic
D3	Cement bunker with lookout	Military	WWII
G-1	<u>Wilson ditch</u>	<u>Agricultural - irrigation</u>	<u>Historic</u>
G-2	<u>Halstead mill</u>	<u>Agriculture - milling</u>	<u>Historic</u>
G-3	<u>Concrete bridge</u>	<u>Transportation</u>	<u>Historic</u>
G-4	<u>Concrete bridge</u>	<u>Transportation</u>	<u>Historic</u>
G-5	<u>Concrete bridge</u>	<u>Transportation</u>	<u>Historic</u>

Sources: IARII 2003; GANDA 2003b

Table 6-24
Historic Military Buildings on DMR

Facility No.	Description	Year Built	Historical Period
00316	Air/fallout shelter	1942	World War II
00343	Air/fallout shelter	1942	World War II
00638	Range support facility	1942	World War II
00651 **	Range support facility	1942	World War II
00700	Air/fallout shelter	1942	World War II
00701 **	Air/fallout shelter	1942	World War II
00702	Air/fallout shelter	1942	World War II
00703	Air/fallout shelter	1942	World War II
1111B	Fw runway surface	1942	World War II
11201	Fw taxiway surface	1942	World War II
11202	Fw taxiway surface	1942	World War II
11203	Fw taxiway surface	1942	World War II
11204	Fw taxiway surface	1942	World War II
11301	Fw pk apron surface	1942	World War II
11302	Fw pk apron surface	1942	World War II
11303	Fw pk apron surface	1942	World War II
11304	Fw pk apron surface	1942	World War II
11310	Fw pk apron surface	1942	World War II
11601 **	Ac maint apron surface	1942	World War II
12601 **	Truck loading/unloading	1942	World War II
84100 **	Water treatment building	1942	World War II

**Structure is listed on the DPW real property list but is not shown on the installation real property map.
Source: IARII 2003



6.11.2 Environmental Consequences

Summary of Impacts

There could be significant impacts on archaeological resources from training activities at DMR. Significant impacts on ATIs could also result from construction and training. As explained in the mitigation sections below, the severity of these impacts will be mitigated by compliance with the PA the Army has developed in consultation with the Hawai'i SHPO, the ACHP, and others. The PA is provided in Appendix J.

Table 6-25
Summary of Potential Cultural Resources Impacts at DMR

Impact Issues	Proposed Action	Reduced Land Acquisition	No Action
Impacts on historic buildings	○	○	○
Impacts on archaeological resources from range and facility construction	○	○	○
Impacts on archaeological resources from training activities	⊗	⊗	○
Impacts on archaeological sites from construction of FTI	○	○	○
Impacts on ATIs	⊗	⊗	○
Impacts on archaeological sites from road or trail construction	⊗	⊗	○
Impacts on archaeological sites from road use	○	○	○

In cases when there would be both beneficial and adverse impacts, both are shown on this table. Mitigation measures would only apply to adverse impacts.

* Impacts may be mitigable to less than significant.

LEGEND:

- | | |
|--|-----------------------|
| ⊗ = Significant | ⊕ = Beneficial impact |
| ⊖ = Significant but mitigable to less than significant | N/A = Not applicable |
| ○ = Less than significant | |
| □ = No impact | |

There are significant but mitigable to less than significant impacts on archaeological resources from the construction of roads and trails. Mitigation measures for archaeological resources that may be affected by road or trail construction will include evaluation of NRHP eligibility and avoidance or data recovery of significant eligible sites.

Less than significant impacts are expected on archaeological sites from constructing the FTI antenna and from using Dillingham Trail.

Proposed Action (Preferred Alternative)

Significant Impacts

Impact 1: Impacts on archaeological resources from training activities. Training would be conducted at DMR by squad-, platoon-, and company-size units of the Stryker Brigade. In general this training would involve the same size units and the same training activities as are currently conducted by the Army at DMR. The difference between current use and proposed use concerns the use of Stryker vehicles, which have the potential to affect archaeological sites in ways that current maneuvers do not, potentially damaging cultural resources. Most of the unconstrained area for off-road maneuvers with Strykers consists of the level ground in the north and central portion of DMR, although a small area in the southeast corner of the installation is also mapped as unconstrained. If tactical vehicles are permitted to move freely in all areas now mapped as unconstrained, some sites that are recommended as eligible for the NRHP could be adversely affected.

Training would occur in areas that are marked as moderate or high sensitivity in regard to the probability of encountering archaeological sites. However, in the level areas, the main concern is the potential for subsurface cultural deposits, especially human burials. Unless these deposits are near the surface, adverse effects from tactical vehicle training should be minimal.

Because most archaeological sites at DMR are on the densely vegetated steep slopes of the Wai'anae Mountains in the south portion of the installation, Strykers will not be able to maneuver off-road in the vicinity of these sites. However, in one area in the southeast, with gentler slopes and less dense vegetation, natural conditions will not restrain Stryker mobility.

Sites 5481, 5484, and 191 are within or adjacent to this unconstrained area. Native Hawaiians consider Site 191, Kawaihoa Heiau, sacred.

In addition to the potential impact on archaeological sites, a series of dredged channels lie below the sites at the higher elevations, in the area between the base of the mountain range and the flats. McGerty and Spear (2001) note that the features "average 4.50 m (14.8 ft), bottom width, to 9.00 m (30 ft) top width, by 3.00 m (9.8 ft) to 5.00 m (16.5 ft) high on each side." These channels at the bottom of the mountains in the southern and southeastern portion of DMR will be avoided by the Proposed Action because they protect the northern flats from possible flooding (McGerty and Spear 2001).

As mentioned above, one of the major cultural resource concerns at DMR is the potential for human burials and buried cultural deposits in the sand deposits in the coastal half of the installation. The primary area of concern would be the high sensitivity areas around the runways. The mitigation measures below will reduce the severity of the impact but not to less than significant levels.

Regulatory and Administrative Mitigation 1. The Army will evaluate archaeological sites within training areas related to SBCT. Sites determined to be eligible for the NRHP and sites pending evaluation will be identified and avoided through protective measures, to the full

extent practicable. If avoidance of identified archaeological sites or newly discovered sites is not feasible, the Army will consult in accordance with the PA to determine the appropriate mitigation for the damage to the sites, such as data recovery or other mitigation measures. To address the accidental discovery of archaeological sites, human remains, or cultural items, the Army has developed an IDP as part of the PA.

The Army will monitor any subsurface excavations in the coastal area and the high sensitivity area around the runways area. The Army will place constraints on any training activities that might involve substantial below surface impacts.

Impact 2: Impacts on Areas of Traditional Importance. The archaeological survey of the proposed alignment has not necessarily identified TCPs or ATIs, although some of the archaeological sites identified might be considered ATIs, including gravesites and temples or heiau. Site 191, in the southeast of DMR, Site 191, the Kawaihoa Heiau, is known as a sacred site. Construction activities and use of Dillingham Trail could damage or destroy such resources as a result of direct or indirect activities, as described in Impact 1. The mitigation measures below will reduce the severity of the impact but not to less than significant levels.

Regulatory and Administrative Mitigation 2. Facility construction or training area uses will be designed to avoid identified traditional places and limit visual impacts on TCPs by site location, design, and orientation, where feasible.

If avoiding identified TCPs or ATIs is not feasible because of interference with the military mission or risk to public safety, the Army will consult with the SHPO and Native Hawaiians in accordance with the PA to identify impacts and to develop appropriate mitigation measures. Mitigation for impacts on the cultural landscape could include consulting with Native Hawaiians and having a cultural monitor oversee construction.

The Army will continue to provide Native Hawaiians with access to traditional religious and cultural properties, in accordance with AIRFA and Executive Order 13007, on a case-by-case basis. This access program will be expanded to include new land acquisitions.

The Army previously identified Native Hawaiian burial sites in the SBCT ROI. The Army completed notification and consultation for these burial sites, in accordance with NAGPRA, and left these human remains in place. To address any impacts on any burial sites, or an inadvertent discovery of Native Hawaiian human remains or funerary objects, the Army will abide by all notification and consultation requirements outlined in Section 3 of NAGPRA.

Significant Impacts Mitigable to Less Than Significant

Impact 3: Impacts on archaeological resources from Dillingham Trail construction. Construction of Dillingham Trail between DMR and SBMR would involve a corridor 15 feet (4.6 meters) wide with 3-foot-wide (0.9-meter-wide) shoulders on both sides.

Constructing Dillingham Trail would involve vegetation removal and grading soil, as well as the regular use of heavy equipment. All of these activities could result in destruction or damage of archaeological resources or indirect damage by contributing to soil erosion.

7.10 BIOLOGICAL RESOURCES

7.10.1 Affected Environment

Biological resources include plant and animal species and the habitats or communities in which they occur. This section is divided into discussions of general wildlife, vegetation, and habitat types common to KTA and KLOA (Figure 7-20). A discussion of the sensitive wildlife, vegetation, and sensitive habitats known to occur or with the potential to occur in this area is also included. Federal, state, and locally regulated species are included in this report, along with rare species, identified by rapid population decline or whose habitat has markedly decreased in recent years. Figure 7-20 shows the KTA/KLOA ROI, which was based on the potential for fire damage and loss of land due to construction and trampling during SBCT training and the introduction of exotic species from Soldiers moving throughout the installation. The extent of these impacts was determined by the type of vegetation present, human-made and topographic barriers, and buffers in the areas around the proposed actions. The ROI includes SBCT actions occurring on KTA, KLOA, Drum Road, and a buffer area, the size of which depends on the type of training or proposed activities that would occur and the fire risk imposed by vegetation and topography.

In addition to defining the ROI by the firebreak potential, a smaller portion of the ROI is based on the extent of habitat degradation imposed by trampling and by the effect of introducing exotic species associated with human activities. This is because in some areas vegetation is very moist, making the risk to fire extremely low. The ROI does not include any marine habitat. While waters near KTA are part of the Hawaiian Islands Humpback Whale National Marine Sanctuary, no project actions occur in this area nor in the vicinity of the coastline, in the nearshore, in the offshore marine habitat, or upland from the nearshore marine habitat.

Recovery Plan

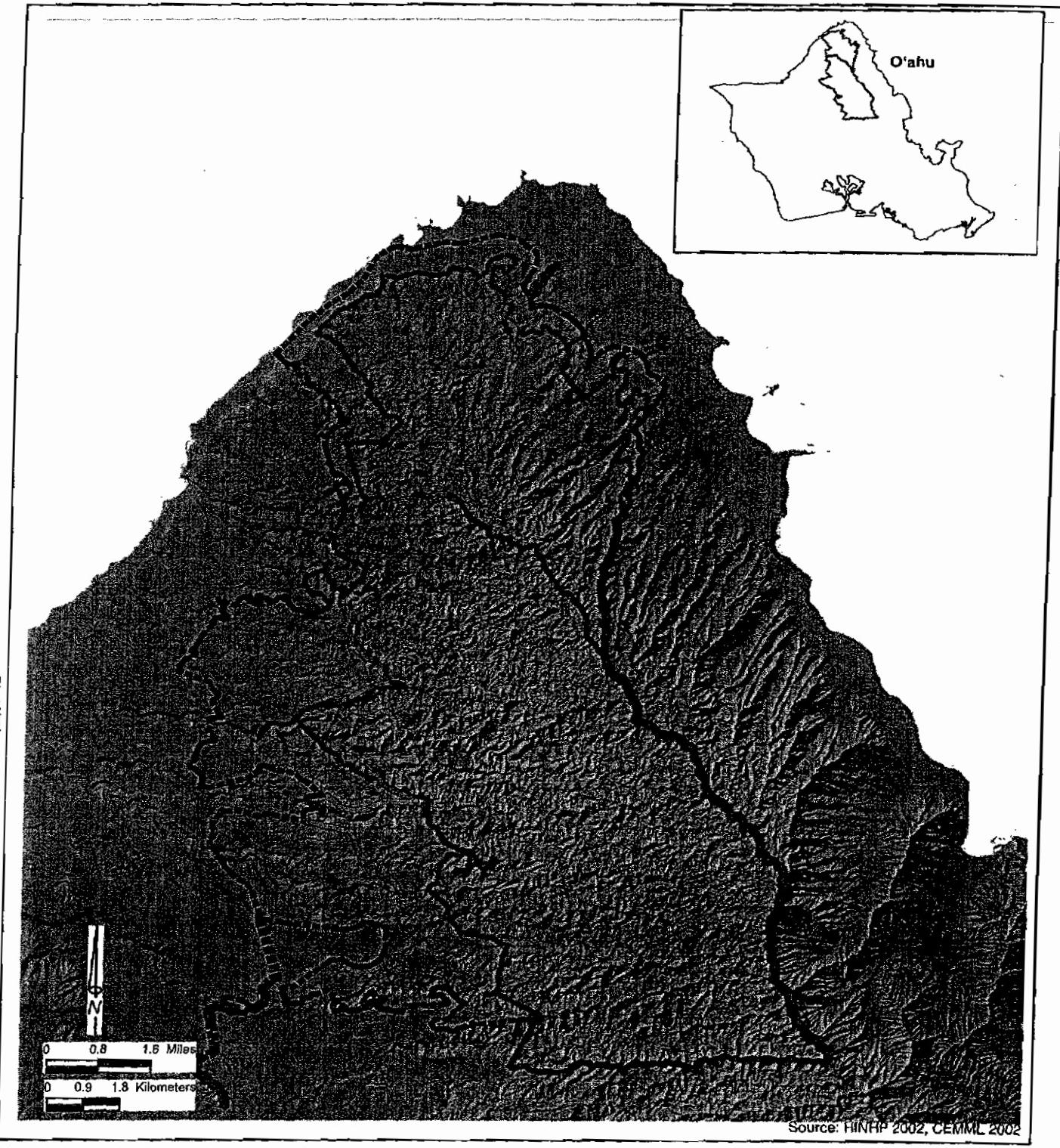
There are 36 plant and 1 animal species with recovery plans that are known to occur or have the potential to occur within the ROI. These species are listed in Appendix I-1a.

Vegetation

KTA, a total of 8,528 acres (hectares), is at the end of the Ko'olau Mountains, on the northern tip of O'ahu. Private, agricultural, and additional Army training lands border it. Botanical surveys to identify rare plants, communities, and potential threats to these resources have been conducted intermittently since 1977. HINHP surveys in 1989, 1993, and 1994 provided the foundation for much of the botanical information used in this EIS.

KLOA is to the north of SBER and to the south of KTA in the Ko'olau Mountains. It consists of 23,348 acres (9,449 hectares). KLOA was surveyed in 1976 and 1977 by the Environmental Impact Study Corporation and later by HINHP (1989 to 1993). Additional botanical and zoological information had been collected on KLOA and adjacent land. Kawailoa is an area of incredible biological richness, with areas of significance for protecting and managing these resources.

P:\A000\HruR000\J397-Transformation\GIS\Layouts\Kahuku Action Area.mxd - 2/20/04 YE



The Kahuku/Kawaihoa Training Areas Biological Region of Influence is largely based on potential impacts from fire and trampling.

Legend

- Drum Road
- Installation Boundaries
- Region of Influence
- Roads

**Kahuku/Kawaihoa Training Areas
Biological Region of Influence**

Oahu, Hawaii

Figure 7-20

Sensitive Species

Potential sensitive species in the KTA/KLOA ROI were identified by USFWS, the State of Hawai'i DLNR (2002a), USARHAW biologists and surveys, and the HINHP (1994).

A current list of all sensitive vegetation and wildlife and any critical habitat in the region is found in Tables 7-20 and 7-21. An assessment of the likelihood of a species occurring on KTA was made based on the habitat requirements and geographic distribution of the species, existing on-site habitat quality, and the results of biological surveys. Natural history descriptions of sensitive species with the potential to occur in the ROI, and specific locations if known, can be found in Appendix I-1 (Recovery Plans 1-1a; Plants: I-1b; Wildlife I-2c; Critical Habitat I-1d).

Sensitive Plant Species in the KTA/KLOA ROI

KTA and KLOA have twenty species of endangered plants, six species of concern and ten candidate species for federal listing. Sensitive plants listed as occurring within the training area include Chamaesyce rockii, Cyanea acuminata, C. crispa, C. humboldtiana, C. koolauensis, C. lanceolata, C. st-johnii, Cyrtandra dentata, C. viridiflora, Doodia falcata, Eugenia koolauensis, Exocarpus gaudichaudii, Hedyotis fluviatilis, Hesperomeles arborescens, Hibiscus kokio ssp. kokio, Joinvillea ascendens ssp. ascendens, Lobelia gaudichaudii ssp. koohauensis, L. hypoleuca, Melicope biakae, M. hyggei, Myrsine fosbergii, Nesoluma polynesianum, Pblegmariarus nutans, Phyllostegia hispida, Platydesma cornuta var. cornuta, Psychotria hexandra ssp. oahuensis, Pteris hyggei, Sanicula purpurea, Stenogyne kaakae ssp. sheffii, Tetraplasandra gymnocarpa, Thelypteris boydiae, Pteralyxia macrocarpa, Myrsine juddii, Viola oahuensis, Gardenia manii, and Zanthoxylum oahuense.

Although the native vegetation on O'ahu's central plateau has been almost completely replaced by agriculture, the KTA/KLOA ROI hosts a very important cache of endangered species and natural communities. The terrain is characterized by deep gulches and high cliffs covered with dense vegetation. Sensitive plants and their likelihood of occurrence in the KTA/KLOA ROI are shown in Table 7-20; documented occurrences of sensitive plant species in the KTA/KLOA ROI are shown in Figure 7-22.

Sensitive Wildlife Species

The following discussion includes a profile of only those sensitive wildlife species that are considered likely to be found in the project area. This information is based heavily on information from the O'ahu INRMP (USARHAW and 25th ID[L] 2001a), ESMPR (R.M. Towill Corp. 1997b), and the biological inventories of KTA and KLOA (HINHP 1994). HINHP biologists and qualified individuals conducted surveys of KTA in 1993 and 1994. Shallenberger conducted special status species surveys of O'ahu training areas, including KTA, in 1977. The latest USFWS and survey information on species and habitat in the SBCT ROI has been incorporated into this evaluation of biological resources. Sensitive terrestrial wildlife and their likelihood of occurrence at the KTA/KLOA ROI are listed in Table 7-21. Figure 7-23 shows the locations of documented sensitive terrestrial wildlife identified in the KTA/KLOA ROI. Sensitive species outlined in the table below are most likely to occur in the higher elevations in the Ko'olau Mountains and are unlikely to occur in the disturbed lowland areas that make up a large portion of the ROI.

Table 7-20
Sensitive Plant Species Occurring or Potentially Occurring in the KTA and KLOA ROI

Scientific Name	Hawaiian Name/Common Name	Federal Status ¹	State ² /Global Status ³	Habitat	Date Last Observed or Confirmed ⁴	Likelihood of Occurrence
<i>Chamaesyce rockii</i>	'akoko, koko, kōkōmālei/-' 'ōhā, hāhā, 'ōhāwai/-' 'ōhā, hāhā, 'ōhāwai/-' 'ōhā, hāhā, 'ōhāwai/-' 'ōhā, hāhā, 'ōhāwai/-' 'ōhā, hāhā, 'ōhāwai/-' 'ōhā, hāhā, 'ōhāwai/-' <i>C. st. Johnii</i>	E	-/G1	Cloud-swept summit and deep wet gulches	2000	C
<i>Cyanea acuminata</i>		E	-/G1	Moist to wet forest	2000	C
<i>C. crista</i>		E	-/G1	Moist to wet forest	2000	C
<i>C. humboldtiana</i>		E	-/-	Moist to wet forest	2000	C
<i>C. kaalaeloa</i>		E, CH	-/G1	Moist to wet forest	2000	C
<i>C. lanceolata</i>		C	-/G1	Moist to wet forest	2000	C
<i>C. st. Johnii</i>		E, CH	-/G1	Cloud-swept ridges	2000	C
<i>Cyatandra dentata</i>		E, CH	-/G1	Moist forest slopes	2000	C
<i>C. nixiflora</i>		E	-/-	Windy wet ridge tops	2000	C
<i>Deltisea subcordata</i>		E, CH	-/G1	Moist to wet forest	2000	C
<i>Doodia biuncii</i>		SOC	-/G1	Moist to wet forest floors, streambanks	2004	C
<i>Eugenia koolauensis</i>	nioi/-	E	-/G1	Dry gulches and slopes	2002	C
<i>Exocarpus gaudichaudii</i>	heau/whiskbroom sandalwood	SOC	-/G1	Moist ridges and shrublands, wet forests, usually associated with 'ōhia	2000	C
<i>Gardenia mannae</i>	nānū, nāū	E, CH	-/G1	Moist to wet forests	2000	C
<i>Hebdomis flavivittis</i>	NCN	C	-/G1	Moist to wet forests	2000	C
<i>Hyperomnia arboreum</i>	NCN	E, CH	-/-	Moist to wet forest slopes and ridges	2000	C
<i>Hibiscus kekoi ssp. kekoi</i>	Ko'olau	SOC	-/-	Dry to wet forest	2004	C
<i>Iomyrsinella ascendens ssp. ascendens</i>	ōhe	C	-/G5	Wet forest and intermittent streams	2004	C
<i>Lobelia gaudichaudii</i> ssp. <i>koolauensis</i>	NCN	E	-/G4	Cloudswept wet forest	2004	C
<i>L. hypoleuca</i>	NCN	SOC	-/G3	Moist to wet forest	2004	C
<i>Melicope triplacae</i>	NCN	C	-/-	Native-dominated moist forest	2000	C
<i>M. hygates</i>	NCN	E	-/-G1	Native-dominated moist forest	2000	C
<i>Myrsine foetida</i>	NCN	C	-/-G2	High elevation Ko'olau forests	2000	C
<i>M. judithii</i>	Kolea	E	-/G1	Cloudswept wet forest	2004	C
<i>Nesoluma polymicrum</i>	keahi	SOC	-/G2	Native-dominated moist forest	2000	C

0052030

7.10 Biological Resources

Table 7-20
Sensitive Plant Species Occurring or Potentially Occurring in the KTA and KLOA ROI (continued)

Scientific Name	Hawaiian Name/Common Name	Federal Status ¹	State ² /Global Status ³	Habitat	Date Last Observed or Confirmed ⁴	Likelihood of Occurrence
		E, CH	-/-	Wet forests	2000	C
<i>Phlegmaria nutans</i> (L.) yepodium <i>nutans</i>)	wāwae'ole/					
<i>Phyllostegia hirsuta</i>	NCN	E, CH	-/G1	Steep, shaded, moist to wet slopes	2000	C
<i>Platiderma cornuta</i> var. <i>cornuta</i>	pilo kea/-	C	-/G2	Moist forests	2001	C
<i>Pritchotria hexandra</i> ssp. <i>oahuensis</i>	NCN	C	-/G4	Moist to wet forests	2000	C
<i>Pteris ligulatae</i>	NCN	E, CH	-/-G1	Steep banks in wet forest	2000	C
<i>Pteridoxia macrocarpa</i>	kaulu	C	-/G1	Native-dominated moist forest	2000	C
<i>Sanicula purpurea</i>	NCN	E, CH	-/G1	Mossy slopes and open bogs	2000	C
<i>Stenogyne keokea</i> spp. <i>stefei</i>	NCN	SOC	-/-	Mesic forest	2000	U
<i>Tetrapiaandra gymnocarpa</i>	'ōhe'ōhe/- ōlopū	E	-/G1	Summit forests	2000	C
<i>Theobertia boydiae</i>	NCN	C	-/G1	Moist forest slopes	2000	C
<i>V. oahuensis</i>	ōlopū	E, CH	-/G1	Cloud-swept summits	2000	C
<i>Zanthoxylum oahuense</i>	āē	C	-/G2	Mesic forest	2000	C

Sources: USFWS 2002a; USARHAW and 25th ID(L) 2001a and b

Notes:

NCN = No common name

Status:

¹Federal:

E = Endangered

SOC = Species of concern

C = Candidate species for listing
CH = Critical habitat designated or proposed for designation

²State

-/- = No Status

³Heritage Global Rank:

G1 = Species critically imperiled globally (typically 1-5 current occurrences)

G2 = Species imperiled globally (typically 6-10 current occurrences)

/-/ = No Status

⁴Date last observed and recorded in one of the above references, or confirmed by USFWS in comment letter dated Jan 5, 2003 and provided to the preparers in Jan 2004.

Likelihood of occurrence on the project site

C = Confirmed

P = Potentially may occur

U = Unlikely

Table 7-21
Sensitive Terrestrial Wildlife Species Occurring or Potentially Occurring on KTA/KLOA ROI

Scientific Name	Hawaiian Name/ Common Name	Federal Status ¹	State ² /Global Status ³	Habitat	Date last observed	Likelihood of Occurrence
Invertebrates						
<i>Achatinella operculosa</i>	pūpū kuahiwī, pūpū kanioe, kāhuli/O'ahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 meters)	2001	C
<i>A. byronii/decipiens</i>	pūpū kuahiwī, pūpū kanioe, kāhuli/O'ahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 meters)	2001	C
<i>A. curta</i>	pūpū kuahiwī, pūpū kanioe, kāhuli/O'ahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 meters)	1986	C
<i>A. lila</i>	pūpū kuahiwī, pūpū kanioe, kāhuli/O'ahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 meters)	2001	C
<i>A. hawaiiensis</i>	pūpū kuahiwī, pūpū kanioe, kāhuli/O'ahu tree snail	E	E/GH	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 meters)	2001	C
<i>A. pulcherrima</i>	Pūpū kuahiwī, pūpū kanioe, kāhuli/O'ahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 meters)	1974	P
<i>A. sowerbyana</i>	Pūpū kuahiwī, pūpū kanioe, kāhuli/O'ahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 meters)	2000	P
Birds						
<i>Aegotheles flammeus</i> <i>isabellinus</i>	puco/Hawaiian short-eared owl	SOC+	E*/G5T3	Pastures, grasslands, dry and wet forests that are dominated by either native or nonnative vegetation. Sea level to 7,900	1985	C
<i>Chasiempis sandwichensis</i> <i>Ibis</i>	O'ahu 'elepaio/-	E, CH	E/G4T1	Native Hawaiian forest	1977	P
<i>Himatione sarginea</i> <i>sarginea</i>	'apapane/-	+	-/G4	Hardwood forest, primarily native 'ohia and 'o'hia- koia and mixed native-exotic forest at high elevations.	1993	C
<i>Pararomissa maculata</i>	'alauahio/O'ahu creeper	E	E/G1	Native Hawaiian shrublands, forests, and bogs	1985	C
<i>Vestiaria racinina</i>	'iwi/Hawaiian honeycreeper	+	E*/G4	Native forests, especially 'ohia forest	2000	C

0052032

7.10 Biological Resources

Table 7-21
Sensitive Terrestrial Wildlife Species Occurring or Potentially Occurring on KTA/KLOA ROI (continued)

Scientific Name	Hawaiian Name/ Common Name	Federal Status	State ² / Global ³ Status	Habitat	Date Last Observed	Likelihood of Occurrence
Manuals						
<i>Laniarius cinereus semirufus</i>	-/Hawaiian hoary bat	E	E/G5T2	Bare rock, cliff, hardwood forest, grassland/herbaceous, hardwood woodland, and riparian habitats	1976	P
Fish						
<i>Lentipes concolor</i>	‘ōpu ‘alamo‘o / *	-	-/G3	Freshwater, brackish, and marine habitats, depending on life stage	2000?	C

Sources: USARHAW and 25th ID(L) 2001a; HDLNR 2002a; HINHP 1994; R. M. Towill Corp. 1997; NatureServe 2001; Virginia Tech 1998

Notes:

NCN = No common name

*The state endangered listing refers only to the populations on O‘ahu, Lanai, and Molokai

Status:

/ - = No Status

¹Federal:

E = Endangered

SOC = Species of concern

CH = Critical habitat designated or proposed for designation

+ = Birds of Conservation Concern

³Heritage Global Rank:

G1 = Species critically imperiled globally (typically 1-5 current occurrences)

G3 = Species rare with restricted range (typically 21-100 current occurrences)

G4 = Species apparently globally secure

G5 = Species demonstrably globally secure

GH = Species known only from historical occurrences

T1 = Subspecies critically imperiled globally (typically 1-5 current occurrences)

T2 = Subspecies imperiled globally (typically 6-10 occurrences)

²State

E = Listed as endangered

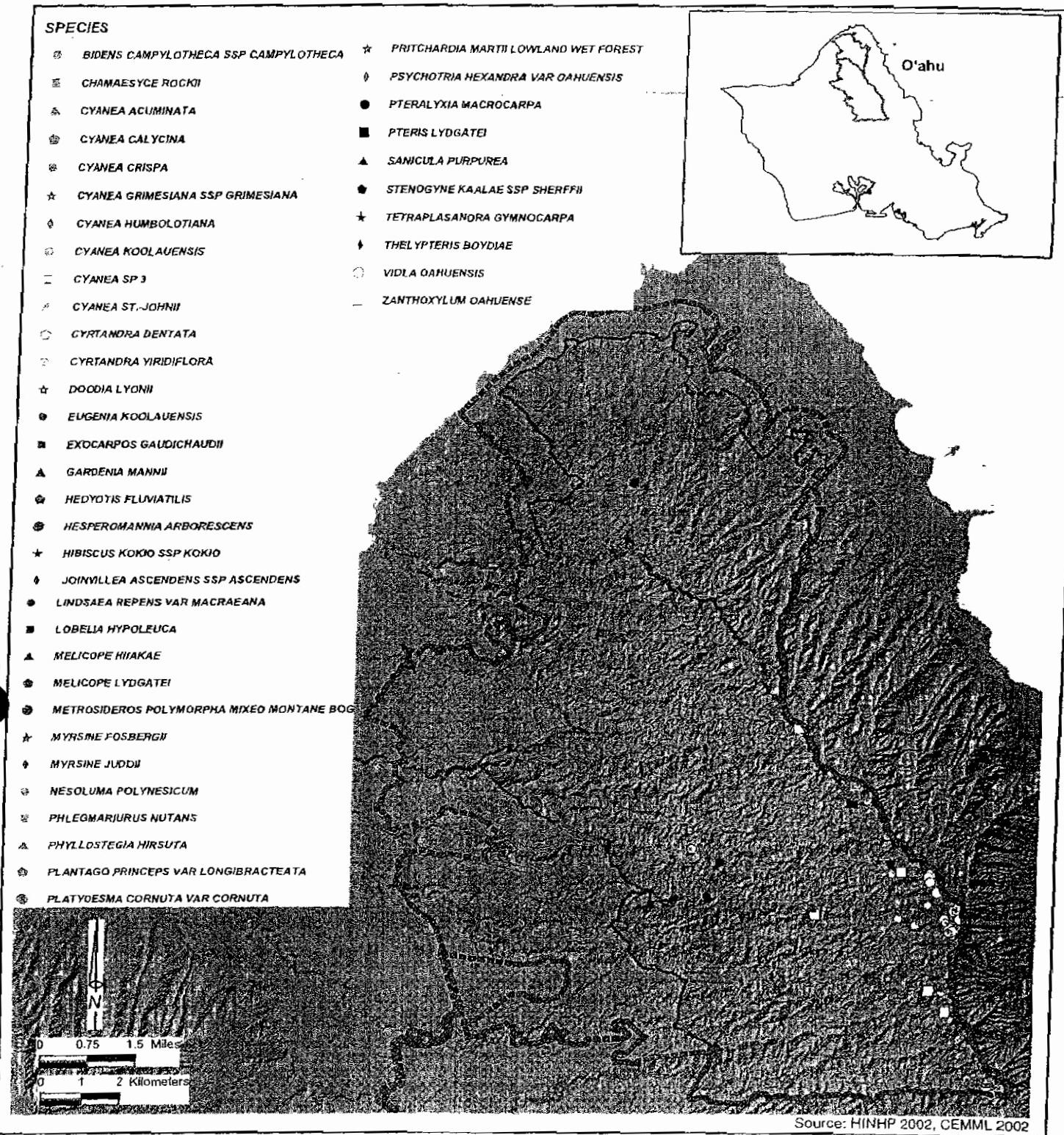
Likelihood of occurrence on the project site

C = Confirmed

P = Potentially may occur

U = Unlikely to occur

0052033



R:\New\J357\Transformations\GIS\Layouts\Kahuku_Kawaiola_Plant.Species.mxd ·

Forty one sensitive plant species have been recorded within the Kahuku/Kawaiola Training Areas Region of Influence.

Legend

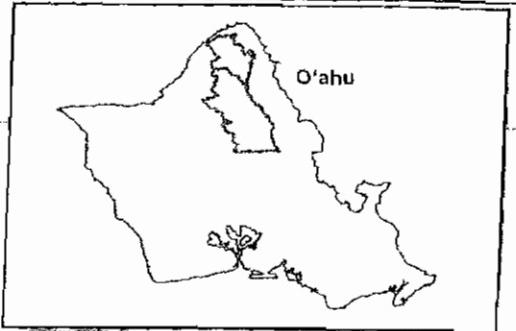
- Drum Road
- Installation Boundaries
- Region of Influence
- Roads

Sensitive Plant Species in the Kahuku/Kawaiola Training Areas Biological Region of Influence

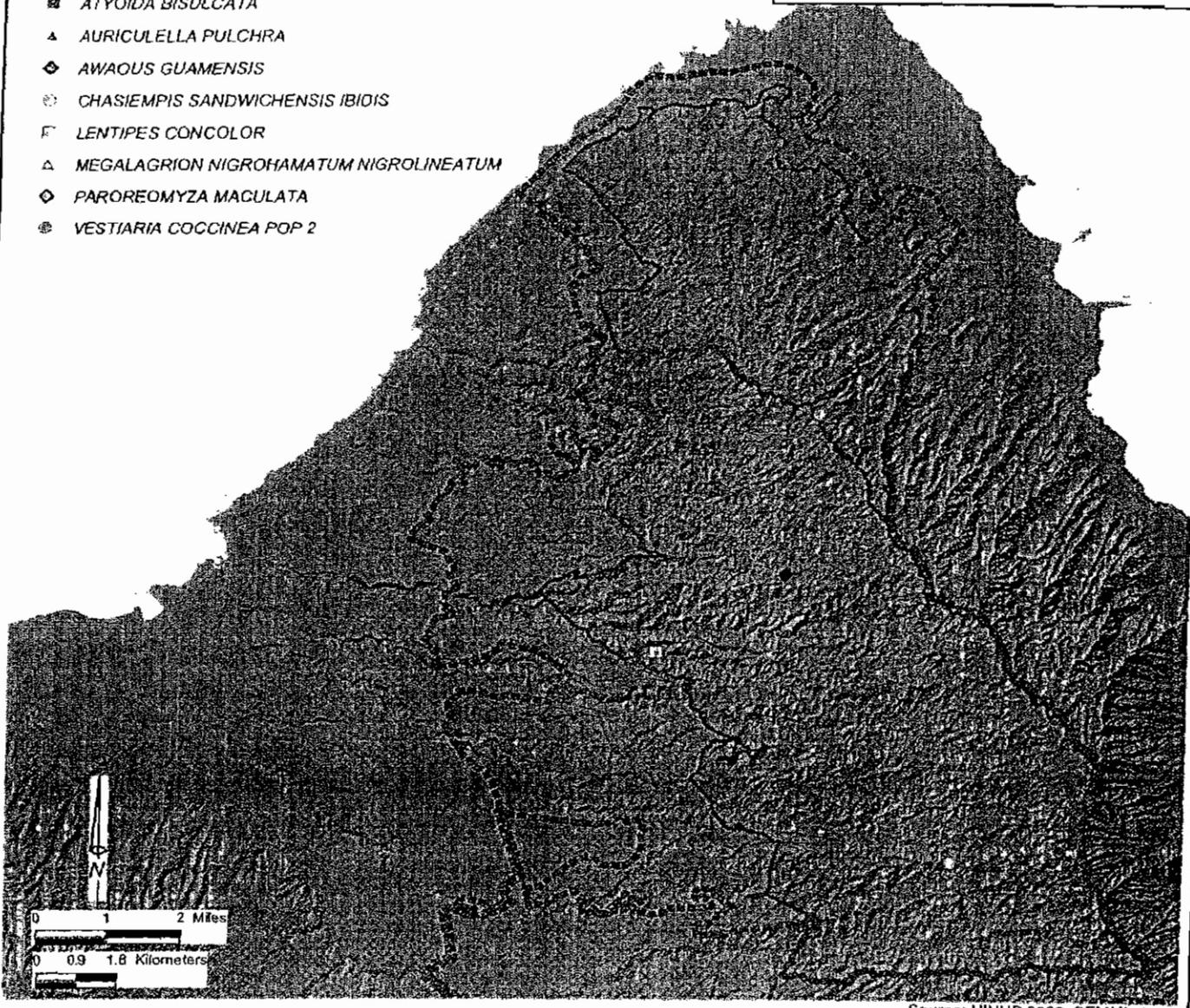
O'ahu, Hawai'i

Figure 7-22

- ACHATINELLA APEXFULVA
- ACHATINELLA BULIMOIDES
- ▲ ACHATINELLA BYRONII/ DECIPIENS
- ◆ ACHATINELLA CURTA
- ☒ ACHATINELLA LILA
- ▲ ACHATINELLA LIVIDA
- ◊ ACHATINELLA PULCHERRIMA
- ACHATINELLA SOWERBYANA
- ☒ ATYOIDA BISULCATA
- ▲ AURICULELLA PULCHRA
- ◊ AWAOUS GUAMENSIS
- CHASIEMPIST SANDWICHENSIS IBIOS
- F LENTIPES CONCOLOR
- △ MEGALAGRION NIGROHAMATUM NIGROLINEATUM
- ◊ PAROREOMYZA MACULATA
- VESTIARIA COCCINEA POP 2



R:\New\J397\Transformation\GIS\Layouts\Kahuku_Kawaiola Wildlife Species.mxd - 2/22/04 - YE



Source: HINHP 2002, CEMML 2002

Sixteen sensitive wildlife species have been recorded within the Kahuku/Kawaiola Training Areas Region of Influence.

- Legend**
- Drum Road
 - Installation Boundaries
 - ☒ Region of Influence
 - Roads

Sensitive Wildlife Species in the Kahuku /Kawaiola Training Areas Biological Region of Influence

O'ahu, Hawai'i

Figure 7-23